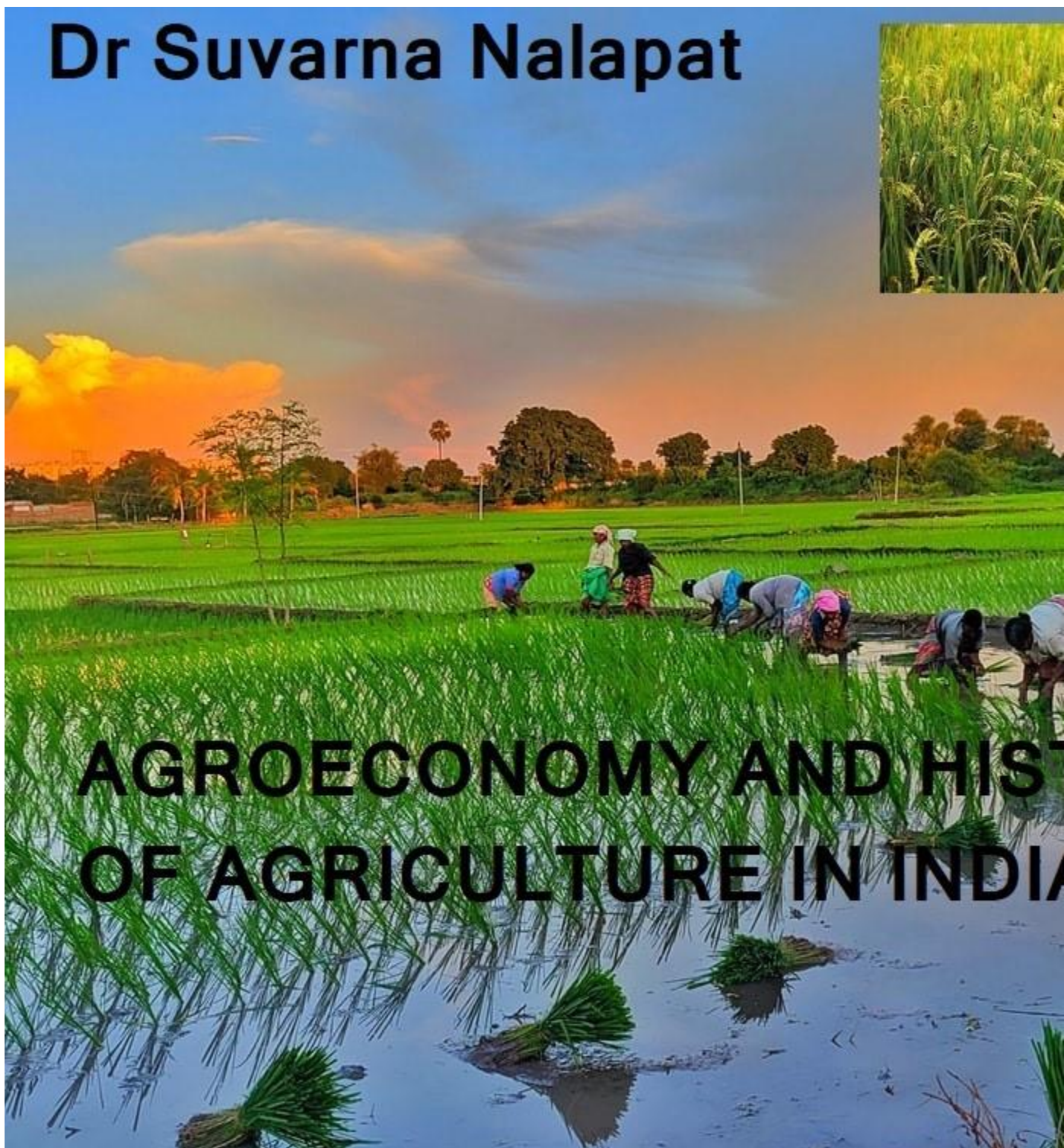


Dr Suvarna Nalapat



AGROECONOMY AND HISTORY OF AGRICULTURE IN INDIA

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.Nutritious food for all

- **Food self sufficiency by agro production**
- **Population control for all citizens alike**
- **Water conservation which includes rain water conservation and harvesting and natural water (rivers/freshwater lakes) utilization**
- **Irrigation in areas where fertility of land ensures food production and the small scale bunds and reinforcements,surangams ,well and tank irrigations used in all areas where it is available**
- **Organic farming which reduce chemical pollution leading to ill effects on nature as well as on health**

2. Health integration through music therapy is a programme by which I would like to do away with separatisms of religions,castes, languages and other groupist tendencies

This is a part of value based education and the integration of arts and sciences under one roof for client-oriented, family-oriented comprehensive healthcare and humanitarian approach.

In 1882 Max Muller said : If I were to look over the whole world to find out the country most richly endowed with all the wealth ,power and beauty that nature can bestow-in some parts the very paradise on earth- I should point to India ...There are many bright dreams to be dreamt about India ,and many bright deeds to be done in India ,if only you will do them “.



PREFACE

VILLAGE ECONOMY OF INDIA THROUGH AGES.(SUMMARY AND PLAN OF THE BOOK) .

THE CONTINUOUS PROCESS OF CHANGE AND STABILITY

The institution of village panchayath was developed earliest and preserved longest in India among all the countries of the earth. (Report of the congress village panchayath committee 1954 pp 9)¹. It was first introduced by king Prithu who ruled India. This was the basic unit of administration from vedic age. Graamani was the chief leader of the village in Rigveda. The gramsabha is mentioned

in shanthiparva of Mahabharata and in Manusmrithi. Shreni was the name of the merchant guilds of the old panchayaths and their Chief was the sreshti. (Chetthy in local Malayalam). In Valmiki Ramayana a janapada is a Federation of republics and Brihadaranyaka Upanishad (ch 2 Sathrubrahmana) knows it. And Arthasasthra in BC 500 describes it. Even during the time of Alexander, 16 janapadas existed in India and the entire south India was a single united janapada called the Andhraka or Andhra country. Megasthenes calls the south Indian Andhrake as Pentadas or a great panchayath. Panchajana and panchajani are used in Bhagavatha and in local Tamil and Malayalam it is Anjoottuvar .

Panchaayathana means the abode of the five groups as a republic. Entire south was a republic of the five people or panchajana, mentioned in the vedic literature. During time of Alexander North India had split into 15 janpada and south remained the invincible united single republic.

Hieun Tsang & Fa Hien about the productivity and economic solidarity of India opined that “ The people are flourishing and happy beyond comparison”. Sura Neethisaara speaks of the Indian administrative units as a composite whole that provided composite leadership and management of village affairs. Dharmasasthras and sasthras give references of iron and puga or village and town corporations. Archeological evidence prove existence of both. Till the advent of East India company the panchayaths survived the wreck of several dynasties and downfall of empires (S.N. Agarwal .Gandhian constitution for Free India)². When political storms burst over the entire land these systems survived (R.K. Mukherjee Local government in ancient India .pp10)³ Gandhiji in “Panchayaths and its judicial aspects “(Harijan dt 8.12.1946)⁴ said this longevity of village state protected the life and property and made civilized life possible.

In 1812 East India company's committee of secretary's report of EIC ,observed" Foreign conquerors swept over India ,but village municipalities stuck to the soil like their own kusa grass, The Scythians,Greeks,Saracen,Afghans,Mongols came down from the mountainous lands above .Jew,Arabs,Romans,Portuguese ,Dutch ,French and English and Dane through the seas and set up trade and successive dominations but the religious trade unions –the villages-remained as little affected by their coming and going as a rock by the rising and falling of a tide.(sir Charles Trevellyn .Industrial Act of India pp320)⁵This was thus the basic unit of administration as well as the stability and strength of India. An ancient village was a little republic,selfsufficient and autonomous ,governed by its own elected officers satisfying its own needs ,providing for its own education,policing,tribunals,all economic necessities and functions managing its own life as independent self-governing units(Aurobindo.Foundations of Indian culture pp403)⁶.The free organic village type of co-operation and trust ,and honesty was only very recently learned and streamlined by the machinery of the British Beurocratic system of administration (Ibid 391-392).⁷Karl Marx wrote:" The small extremely ancient Indian communities still exists ,based on communal ownership of land upon a direct linking upon manual agriculture and handicrafts and upon a fixed form of division of labour which is adopted as a cut and dried scheme wherever new communities are founded.They constituted selfsufficient productive entities. The area of land of production range from 100 –several thousand acres. The greater part of the produce is for the satisfaction of the immeadiate needs of the community and not as a commodity.Production itself is independent of division of labour which the exchange of commodities has brought about in the Indian society as well. Every family carries on spinning ,weaving as an accessory occupation(pp 357 -358.Das capital manuscript pp 693 q C.B.Mammoria).⁸

Minutes of the evidence taken before the select committee on affairs of the East India Company (vol 3 1832 pp131-132 Appendix 84)⁹ says:- “I therefore wish that the village constitution may never be disturbed and I dread every thing that has a tendency to break them up .”Yet it was disturbed ,history proves.Dr Atlekar called villages as the axles of the administration from ancient times.(S.S.Atlekar .Praacheen Bhaaratheeya shashan padhathi pp168)¹⁰.Village communities grew out of the earliest tribes of India ,who expressed the natural and geographical conditions of the country ,not from any outside source .The organized functioning on which the culture grew out of village panchayaths(H.D.Malaviya .Village panchayaths in India 1956.pp77-78)¹¹

What is a panch or a panchajana and their panchajanapada?

In Malayalam/Tamil literature the word is Anjoottuvar (the groups of 500) and Aivar(the five).The panch groups are the organizing units of 500 each (2500) of a small janapada.The election of the 5 to 9 members from this group is by consensus /by ability /by the election by showing hands etc.In Kerala the election is based on consensus by all the five members of the five families and the eldest of the five is selected and all others help him in administratin.From each region a sarpanch or chief look after the affairs and report periodically to the committee of the five in front of the chief.In Bihar the chief is selected without election. And executive committee nominated by him and the members are from 7 to 15 (Ezhunoottuvar).In West Bengal and Rajasthan by show of hands .The number of members depends upon the population of the region.The gramasabha consists of the entire village population and it is they who elect the panchayath In Vedic literature evidence of a strong panchajana and efficient agrarian economy is seen. A well-balanced socioeconomic political system was established on the same principle from Kumari to the Himalaya and an ideal form of co-operative agrarian and

industrial society existed in them and in it there was no scope for exploitation of the poor by the rich. As Gandhi said “The production was simultaneous with consumption and distribution”. The vicious system of money-lender economy was checked by this system and was conspicuous by its absence. People had their own Nidhi (padmanidhi, samkhanidhi etc) to which they contributed on voluntary, co-operative basis in kind or service so that in times of need they could depend upon it. The nidhi was with the central temple and the Guru who is a selfless person attached to it. (A temple centered treasure). In famines, natural calamities and in other times people were freely fed and looked after with this nidhi and for trade and commerce loans could be taken from this without interest. The whole social structure was on nonviolence and fellow feeling. Dharma was the key word of administration. Village affairs, justice, peace, law and order by watch and word, giving facilities for irrigation, construction of public works like tanks, lakes, wells, dams, gardens and orchards and public resting places, building of roads, common amenities, collection and distribution to all on equal basis, keeping accounts and dealings honestly were considered dharma by each and every citizen. This dharma was the religion. The chieftain and the chief adviser the Guru and the entire population was responsible for these and the people contributed their share by service or by produce which was fixed. Even the village chief was subject to this law. The land belonged to the entire people since it is God's. At the same time individual families had the janmam (by birth) properties existing on their ancestral lineages, honest service of the land for several years etc. These became corrupted and bureaucratic during the British rule and the effort of the independent Indian Government during the first 3 five year plans was to reestablish the old state. What were the causes of the decay of the ancient institution during the British rule?

1. The enhancement of the land revenue to utmost limits which the villager could not meet with.

2. Centralisation of the judicial and executive powers in their own hands. The village functions lost all their ancient age-old powers. The chieftains were converted into just intermediaries between the British Government and the people. They had to obey the law of the new Government and raise the revenue from the people which they did not have. This led to resentments and revolutions of two types. One was revolution and upsurges by the local chieftains and people together to the British rule. The other was the revolt of the peasant to the Government and the erstwhile chieftains who had turned to be just tax collectors and have lost leadership dharma and became just bulleys, pleasing either sides and changing sides they became liable to adharm.

4. All means of communication of the ancient people were either destroyed or changed. The old ways of communication and the preservers of ancient trade routes destroyed and new routes established so that trade could not be carried out between neighbours.

5. Forests destroyed. Fauna, flora and natural foods of people became inaccessible to them. Malnutrition, hunger, and from it clandestine habits originated which were dealt with in the harshest way by the administration.

6. Individualism increased, the old joint family system as a co-operative agrarian and industrial unit disintegrated and decayed which affected the productivity and economy of the nation.

7. The community life turned to nuclear family. The national disintegration of the panchayat and its chieftain and its temple/ educational /university centers as distribution centers in need of calamities and famines led to collapse of entire system.

8. Old panchayaths were informal affairs of the entire village community. Not statutorily constructed. The working was on free will and co-operation of entire people for common good. The British rules and Acts killed all these. (H.D. Malaviya pp 220 Village panchayaths in India 1956)¹²

The view of Malaviya is not completely true but only partially true. The British rule, because of its unawareness of the solid secure nature of the system in the geographic agro economic region did kill it partially, but the total death happened when the new academicians started to say everything, any literature source or oral knowledge of the land is only a myth and has to be totally rejected on the basis that it is religious (by thinking that Hindu is the name of a religion and not of a geographic region)

9. The Royal commission of Decentralisation (1907):- In 1896 and 97 the local self Government resolution completely ignored village administration. Therefore Edward VII appointed a committee on decentralization in 1907-08. Its report (vol. 1909 in 1907-08 pp 236)¹³ recognized village as the primary territorial unit in India and from them are built up larger administrative units. It wrote :-
“Their autonomy has disappeared owing to the establishment of local, civil and criminal courts, the present revenue and police organizations the increase in communication, growth of individualism, education and operation of individual raiyatwari system extending even in the north of India. Nevertheless the village remains the first unit of administration, the privileged village functionaries are largely utilized (headman, accountant, village watchman) and paid by the Government and there is still a certain amount of common village feelings and interests. (ibid pp 237)¹⁴ The committee recovered the constitution of village panchayaths for administration of local village affairs.” Foundation of any stable edifice which shall associate the people with the administration must be the village in which people are known to one another and have interests which converge on definite and well recognised objects like water supply salvation. (ibid pp

239)¹⁵Therefore the local disputes ,factions influence of landlords and castes were considered with gradual and cautious approach by the British administration. In 1915 May, the resolution of self Government for India was issued by the Government on this committee's recommendation ,but in a half hearted manner.In 1919 Montague –Chelmsford Reform and transfer of power to local self Government and legislation of village Panchayath Act passed.This was followed by

- 1.The Madras Panchayath Act XV 1920
- 2.Bombay Village panchayath act 1X 1920
- 3.Bengal Self Government Act V 1919
- 4.UP Panchayath act VI 1920
- 5.Punjab Panchayath act 111 1922
- 6.Bihar self Government act V 1920
- 7.MP panchayath act V 1920
- 8.Assam self Government act 1925
- 9.Princely states enacted legislation for this:
 - Mysore 1926
 - Baroda 1926
 - Indore 1920
 - Cochin 1919

Bikaner

1928

The different experiments like srinikethan(Bengal) and Marthandam(in Travancore)happened in this period. After independence, one of the directive principles(article 40)contained steps to organize village panchayaths and endow them with such powers & authority necessary to enable them to work as units of selfgovernment..Panjayathi Raj comprehended both democratic institutions and extension services through which the development programmes are instituted. According to the first plan”unless a village agency can assume responsibility and initiative developing the resources of the village “,that is,”the necessary leadership” and human resources” from the villages panchayathi development will lag behind. People themselves through a honest leader giving wholehearted support to him, with timely assistance from the state and central administrative bodies can build up themselves the village as well as the nation.The second plan also recognized “the just and integral social structure in rural areas and in developing a new pattern of rural leadership”(pp 151 sec 5 yr plan)¹⁶.The 3rd five year plan laid the panchayathi Raj institutions to develop co-operatives ,to create a climate for community effort ,and social responsibility vital to the successful making of co-operative communes and at all levels of administration. In 1961 conference of state ministers of Panchayaths in Hyderabad it was decided that promotion of co-operatives will be one of the 10 point tests of panchayathi raj.The criteria for measuring its success were laid down as every member of the panchayath becoming its member in due course of time in his/her own right.

The implementation of the scheme had started as early as 1957 January by the study of Balwant Ray Mehta to examine the community development programme.It realized the democratic decentralization of administration to create institutions of democratic administration at village level ,block and district levels.The panchayathi raj conceived by this committee as a process of democratic decentralization has a poor record of

functioning. The reasons are the poor and inadequate funds as well as power at their disposal and the three tier system of decentralization proposed have become bureaucratic in every state. The grassroot level (Village panchayath/gramsabha) the middle level (panchayath samithi at Block level) and apex at zilla /district level function in discordance at several places due to the centralized bureaucratic ways adopted and hence the failure. The power remains centralized still in the hands of a few who are the decision makers and the majority, though they have knowledge and awareness are sidelined or marginalized and their voice ignored by the people in power. Thus the human resources are not utilized fully and leadership has failed in each village to elect the selfless leader, who is ready to work for the common good of all. The principle objectives of the 3rd plan included increasing agricultural production, development of rural industries, fostering co-operative institutions, full utilization of local manpower and local resources –physical and financial –available for each panchayaths, progressive dispersal of authority and initiative, with special emphasis on role of voluntary organizations. Assessing the economic weaker sections of the village community and bringing them to the forefront, fostering cohesion and encouraging spirit of self-help within the community were other objectives. When the programme began Kerala was top in terms of population per panchayath (15493 per panchayath) and Orissa followed with 6746 and UP was less than 1000 (pp 706 Dr Mamoria)¹⁷.

In this book I have taken a **sample village, Punnayurkulam** for study. This village is in the district of Thrissivaperur, in Kerala state, in India and is a global representative village for the study purpose.

Why was this area selected?

1. This area has the only freshwater lake in the entire Malabar

2.It is historically described right from the sangam ages

3.The river Nila alias Bharathapuzha connects as a natural waterway from Arabian sea to the Palghat ,and from Palghat pass to beyond the Sahya mountains to Tamil country and on either side of the Palghat pass was ruled by the erstwhile Chera kingdom before Christ. This was a very important trade and commerce root in ancient India

4.It is in the mid position on the west coast of Kerala.

5.The agricultural situation is well described by Logan in his manual so that the British Malabar history is available .

6.The kol puncha fields of the area is very specific.It is comparable to the same weather and low-lying conditions of cherrapunchi (the puncha of the cherra)in Assam even in name.

7.The best possible agricultural spots of ancient Kudanaad of Cherra(as opposed to kuttanaad in the south)was the area of the chathrapathi(chathra means a kuda or umbrella)and the large number of umbrella stones and ancient relics here denotes the chera country's ancient relations with the agriculture.The chathra was handed over to chera kings at the banks of river Nila during the kumbhamela called Magha makha.Therefore this was the area which was precious for the dynasty from ancient times.

8.There is a minor reason also.I was born on May 6th 1946 in this village in the preindependent India .And lived there till 1965 when I left to North Malabar,Calicut ,for studying medicine. My father was a farmer and his family owned puncha kol lands and he used to go there regularly and we children also went with him.So that I have seen the changes happening to the agriculture,to the co-operatives and the like from my childhood. He was the one responsible for the leadership and co-operative development of

the entire village till 1969 when he resigned from Congress leadership because of the split in the party with which he was not very happy. I have been part and parcel of all his programmes including that of the Bhoodaan movement, Sarvodaya movement, distribution of old age pension to deserving people, Baalawadi for children, charka for women etc though I didn't know many of its implications then.

There had been lot of changes in the world panorama and the weather changes that have been brought to us by industrial revolution and the use of fossil fuels (coal and petroleum oils, gases etc) and how population have migrated for other regions and how agriculture is affected by these changes and it is high time that we collectively think about measures to conserve the basic elements of the earth pure. And we have to make our sustenance from agriculture in every region possible. Therefore, I have tried to look into the history of this locality in the broad background of the nation and the global situation, and make some practical suggestions to improve its productivity. A proper study and evaluation of the area will go a long way to improve not only the village but also the entire Malabar and Kerala and the nation and the world at large. This is just a humble attempt to do so.

I have divided the book into

1. The pre-independent India

A. The ancient vedic and pre-vedic

B. Archeological and foreign sources of information

C. Historic India from BC 500-AD 1500 (sathavaahana – Vijayanagara period) when the ancient dynasties declined

D., AD 1500-AD 1947 The Moghul and British periods

2.Independent India

A.1947-1967 The first three plan periods .The beginning of reconstruction(20 yrs)

B.1967-1999. Stabilisation(20 years)

C.from 1999-till date(10 years)

3.The current status,problems and solutions suggested

I have done a field survey ,interviewed the village people,and taken interviews and asked informal questions based on literature survey .The help from the Punnayurkulam Krishibhavan , Punnayurkulam village panchayath office,and the village office , and Kol krishi co-operative society had been invaluable for me to carry out this research .I thank each and every one of them and the entire population of the village for being of assistance to me in carrying out the project.Without them this book would never have been written.

I am thankful to P.Parvathy,Lecturer in economics in Government Victoria college for giving valuable suggestions in several matters .

Dr Suvarna Nalapat

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1 Research Area

PUNNAYURKULAM PANCHAYATH –INFORMATION ON AGRICULTURE AND

GENERAL FEATURES.

According to the 1991 census, the general information on Punnayurkulam Village Panchayath:-

This is a special grade Panchayath, in Chowghat Block, Chowghat Taluk, in Trichur District, consisting of 15 wards (now it has 18 wards).The total area is 18.71 square KM.Total population is 29795, men 13965 and women 15830 (more than men).The pattikajaathi people are 3146 and scheduled tribes are not there.There were 4693 houses in 1991.

The boundaries are

North Perumpadappu Village panchayath

South Village panchayaths of Vadakkekad and Punnayur

East village panchayath of Kaattakambal

West Arabian sea.

In the development report of Punnayurkulam (6.01.2001) Smt Fathima Leenus, president of Punnayurkulam village Panjayath, says it is the last days of the 9th five year plan and beginning of the 10th.2001 is the 5th annual plan of the 9th 5 year plan.She mentions that to have total development the plan should be based on long

term protection of the wetlands, soil, water and ecology and the different varieties of plant and animal life. The report of the Block level analysis of the wetlands is given in this report, and also the community development based on agriculture, pure drinking water, women's status, and development of scheduled castes.

Since the area under study is the wetlands, here is given the details of the study of the Block on them and its classification.

What is a wetland ?

Kerala is a land of rivers, canals, and other waterbodies including several backwaters. A wetland is an area where water flows down through all types of channels with fields, lowlying areas, and sloping regions like hillsides etc. From the hilltop to the end of the waterflow is called a wetland. It is a biological unit of water, soil and organic matter which is the basis of all development programmes. According to the area the wetlands are divided into 5 types.

Largest wetlands- above 50000 hectares

Large wetlands –between 10000-50000 hectares

Intermediate wetlands- between 1000-10000 hectares

Small wetlands –between 100-1000 hectares

Very small wetlands –between 1-100 hectares.

The masterplan of the village is based on the small wetlands which are extending over several panchayaths. Therefore the unification of the different panchayaths is done at the block level. In Punnayurkulam village panchayath there are 6 wetlands identified.

1Mandalaamkunnu wetlands

2.Edakkara wetlands

3.Mukkandath thaazham wetlands

4.Paroor padavu wetlands

5Manchira wetlands

6.Cherayi wetlands.

The area of our study is the 4th, Parur padavu wetlands.It extends over the entire 5th and 9th wards of Punnayurkulam panchayath, 3/4th of wards 4 and 6, 1/2 of wards 10, 11, 15, and 8, and parts of 4th ward of Punnayur panchayath and 3/4th of second ward and a small part of 1st ward of Vadakkekad panchayath.

Its boundaries are

West –Althara pananthra road

North Perumpadappu panchayath(Malappuram district)

East the Manchira canal

And south vadakkekad panchayath.

Height from sea level is 10 to 15 meter .Area is 875 hectares.The area is in level with sea and in places below sealevel.The kol puncha fields are below sea level.The water accumulates here during rainy seasons.And in other areas water flows into the sea and is lost easily. This wetland is highly fertile.

The uppungal canal is about 1500 meter and is an important water source.Several other waterbodies which are perennial and dry also

are there in this area. There is shortage of drinking water and as well as water for irrigation even though there is plenty of water here. Three types of soil are seen. Ekkel, sandy clay and clayey sand. In the kol padavu the soil type is sand with lot of clay in it. Main crop is coconut in 747.51 hectares. Next is rice. There is 266.26 hectares of paddy cultivation in Parur padavu, Uppungal and Uppungal north padavu in this area. Mainly puncha is done. But in kol, mundakan also is done. In some places plantains and occasionally tapioca as intermediate crop is done. Only 2-3 % is scheduled castes in the area. the majority are labourers and poor people. More than half of them are below poverty line.

Problems of this area are,

AGRICULTURE.

Mandari of coconut

Mahaali of arecanut

Plantain disease which affects it top(koomb adappu)

Recent fall in price of agricultural products

Lack of water for puncha krishi makes people leave it without krishi(fallow)

The filling of fields for construction of houses affecting the water storage .

The extensive use of chemical fertilizers changing the ratio of alkali and acid in soil and increasing the cost of agriculture and decreasing the productivity

Problem solving suggested by the panchayath

- 1.The disease control for the said diseases
- 2.prevent the filling of fields.Give awareness of its social ,economic and ecological Problems
- 3.To get enough water for kol krishi construct a permanent bund in Parur padavu ,and increase the depth of the canals and tanks and make walls around them
- 4.Use of organic manure instead of chemical manure
- 5Only after determining the alkalinity and acidity of the soil one should use chemical fertilizers,that too only sparcely according to need
- 6.With help of the agricultural department organize awareness classes.

WATER RESOURCES

The natural canals and tanks ,wells of the area are dried up in summer so that there is shortage of water for drinking and irrigation .The wells associated with and in the vicinity of fields is suitable only for irrigation and for drinking purposes.

Problem solving suggested by the panchayath

- 1.make public wells and tubewells
- 2.Sprinkle chemical to kill pests only according to the direction of the wind and try not to pollute drinking water
- 3.Make the canals and tanks more deep and keep them protected with boundary walls

ANIMAL PROTECTION

1/3 Population depending upon the animal husbandry have abandoned this due to scarcity of natural grass ,and cost of the artificial fodder,and the lack of marketing facilities for diary products.

Suggestions by Panchayath

- 1.In the fallow lands make grasslands for grazing animals
- 2.Conduct classes on animal husbandry by technical people
- 3.Make marketing facility for the products.

FISH

No one in this area goes to sea to catch fishes though it is very near to sea.The fish are caught from tanks and canals .This is done only in rainy seasons.The availability of fish is very little since they are following only traditional methods to catch fish.In dry season this job opportunity is not available.

Suggestions by panchayath

- 1.The tanks and canals to be made more deep.
- 2.Do fishfarming
- 3.Give encouragement to do fishfarming
- 4.The centers for growing fish and for marketing fish to be established

5. Protection of fish and ecology for that

FORESTS

There are no forests in this wetlands. The available old trees are felled and new construction works are increasing. The ecological problems due to that are increasing day by day.

Suggestions by Panchayath

1. Give awareness to plant trees in public places
2. Give awareness of ecological problems when there is deforestation
3. To increase the organic wealth of earth trees have to be planted.

ENERGY

Fuel, gas and kerosene are used by the people. Electricity has reached most of the parts of this area and yet there is voltage problem. The cost of kerosene and gas is high. The fuel from wood is now scarce and trees felled and no new ones planted is increasing the problem.

Suggestions

1. The construction of the electric substation of Punneyurkulam panchayath to be speeded up
2. Have smokeless ovens
3. Give economical help for biogas plants
4. Have more trees planted

EXTERNAL INFLUENCES ON WETLANDS

There is no transportation facilities.No factories or other industrial institutions.

Suggestions of panchayath

- 1.Tarring the available roads
- 2.Maintainance of the roads
- 3.Start possible industries

The Panchayath has recorded that before this (2001) no development programmes have been done based on wetlands in this area (which we will find is not true).The panchayath has suggested controlling the disposal of wastes from butcher shops in public places, making latrines for families who do not have them, and with the help of the health department give awareness about the cleanliness to the people.

WETLANDS IN CHOWGHAT BLOCK

Serial no:	Wetland name	Area hectare	Village panchayaths
1	Mandalam kunnu	625	Punnayurkulam,punnayur
2.	Edakkara	625	Punnayurkulam,punnayur
3	Mukkandathuthaazham	800	Punnayurkulam,punnayur
4.	Parur padavu	875	Punnayurkulam,punnayur,vadakkkekad
5.	Manchira	225	Punnayurkulam,vadakkkekad
6.	Andikkot kadavu	550	Punnayur,vadakkkekad

7	Vylathoor	575	Vadakkekad,pookot
8.	Palakuzhi thozhiyur paadam	650	Vadakkekad,pookode,Guruvay ur municipality
9	Kadappuram	750	Punnayur,chowghat municipality
10	Mathikkayal	875	Punnayur,chowghat municipality and seashore
11.	Edakkazhiyur	600	Punnayur,pookode ,chowghat and Guruvayur municipality
12.	Pookode	750	Pookod,Guruvayur municipality
13.	Valiyathod	700	Thaikkad,Guruvayur municipality
14.	Chamramthod	400	Thaikkad
15	Chovvallur pady	972	Thaikkad Guruvayur and chowghat municipality,orumanayur
16	Orumanayur	450	Orumanayur,seashore,chowgha t municipality
17.	Cherayi	175	Punnayurkulam

Why Punnayurkulam panchayath and Parur padavu was selected as sample is evident from this table. The Punnayurkulam panchayath spreading through 6 of the wetlands is-the most extensive area of the entire chowghat block.And among these six, Parur padavu is the largest with 875 hectares of wetlands.Kerala development programme 204-2005 of Punnayurkulam village panchayath has pointed out that in entire Chowghat block the highest quantity of paddy production is from Punnayurkulam village panchayath and there itself the most comes from Parur padavu and Uppungal padavu. (pp17)

**CHANGE IN POPULATION PATTERN SEEN IN REPORT
OF DEVELOPMENT OF VILLAGE PANCHAYATH
,PUNNAYURKULAM. 2001(1991 census)**

Total population	29795
Male	13965
Female	15830
Scheduled caste	3146
Male	Not mentioned
Female	Not mentioned
Number of houses	4693
Scheduled tribes	Nil

Comparison (2001 and 2008-09)

Total population	29795 to 31818	2023 more
Male	13965 to 14650	685 more
Female	15830 to 17168	2338 more
Scheduled caste	3146 to 3199	53 more
Male	1585	
Female	1614	
Number of houses	4693 to 4963	270 more
Scheduled tribes	Nil	

In page 31 of the janakkeeyaasoothrana plan of Punnnayurkulam panchayath we find a statement that Punnnayurkulam had social inequalities historically and the scheduled castes and scheduled tribes of Indian constitution 341-342, were facing severe social, economical and educational backward position and in Punnnayurkulam village in 536 families, there are 1672 men and 1721 women of this category. The increase in general population is reflected in their increase. Pulaya, vettuva, paraya and very few mannan, paanar, and kurava are in this group. According to this statement the one idanghazhi or one vallypaddy for a day's work

was not enough for them to appease their hunger. After this the wages changed from barter to Anna. For one man 1 and ½ anna and for woman ¼ anna.

The Punnayurkulam panchayath as we see it today was formed in 1962 only Punnayurkulam was part of Vannery of the Perumpadappu swaroopa. It was in the Malabar district board initially and was known as two panchayaths, Andathode and Aattupuram. This was under the district collector of Calicut to begin with, and after 1956 it became part of Palghat district. Only in 1970 it came under the Trichur district.

Historically, Punnayurkulam had been under Perumbadappu swaroopa and Zamorin and the British collector of the Calicut district in preindependent period and after independence it was part of Palghat district and Trichur district. Under two swaroopa and under three district collectors it has a very rich administrative and cultural history which is as ancient as Kerala history itself. And the kol development and agricultural co-operation and the structure of the ancient village administration is best studied and understood from its history but unfortunately the modern historians have not done this so far.

To find out the present condition of the farmers in Parur padavukol fields I collected the Form B statement application for subsidiary for the year 2006-2007. (From the kol cooperative society office). According to the reference given above (pp 31 of plan of development) there are only 536 families in Punnayurkulam and according to form B statement 447 of them have asked for subsidy. That means except 89 families all are agriculturists having small or large holdings of fields. Of these 105 are Hindu, 341 are Muslims and only one is Christian. The holdings were categorized as four groups, below one acre, between one and two acres, between two and three acres and between three and four acres and more than four, less than five. And the number of persons calculated as

follows.

AREA TOTAL	HINDU	MUSLIM
Below 1 acre	80	188
Between 1-2 acre	20	129
Between 2-3 acre	5	16
Between 3-4	nil	6
Between 4 -5	nil	2
total	105	341

There was only one Christian applicant and he had between 1-2 acres. So total was 447 and 150 of them had between 1-2 acres. The total area of 449 acres and 25 cents were the property of these 447 applicants and over that I, 34776 Rs and 50 Paise were given as subsidy and 67388 Rs puncha special from the village officer in the said year.

Krishibhavan information

I went to the Krishibhavan to collect information about the status of agriculture in the area and the Asst agricultural officer Mr Dolphin gave me several useful informations

They are summarized below:

1.CROP DETAILS

SL	Name of	Area(Ha	Productio	Productivity(K	% under
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N O	crop)	n (MT)	g /ha)	irrigatio n
1	Paddy	488	2730	5.59	70 %
2	Cocanut	802	68 lakhs No:	SD No:/palm	60 %
3	Arecanut	32	104000 Kg	3250 Kg	100 %
4	Banana	16	256	16000 Kg	100 %
5	Pepper	8	2.2	400 Kg	25 %
6	Jackfruit	2			
7	Cashew	4			
8	Vegetables	8	6.4	8000 Kg	100 %
9	Mango	3			
10	Horticul ture	3000 plants			

2. Group farming samithy 2 numbers

Flori clubs 1 number

3.Agricultural infrastructure available

A.Tractor	2 numbers
B.Tiller	3 numbers
C .Hand sprayer	30 numbers
D Knapsack sprayer	35 numbers
E.Pumpset electrical.	1450 numbers
F.Pumpset (kerosene/diesel engine)	35 numbers.

G.Petty and Para	9 numbers
H.Biogas unit	8 numbers
I.Green home	5 numbers
J.Combined harvester village panchayath)	1 (owned by

4.Land area classification

A.Geographical area	1871 Ha
B.Forest area	Nil
C.Barren land	-
D.Cultivated area	1346 Ha
E.Cultivable waste	26 Ha
F.Fallow land	98 Ha
G.Total irrigated area	918 Ha

5.Paddy cultivation (1 Ha =2.5 here)

Seri al no:	Paadasekarasamithy	Total area(Ha)	Under cultivat ion	Not under cultivat ion	Total available for cultivation &develop ment
1	Parur padavu(puncha)	280	160	120	

2	Uppungal padavu(puncha)	72.5	72.5	Nil	
3	Cherayi koottukrishi samithy(mundakan)	44.	30	14	
4	Bhattathiripaad paadasekharam(Mu ndakan)	52	8	44	
5	Eachi paadasekharam(Mu ndakan)	40	16	30	
Tot al		488.5	286.5	208	Puncha 120 Mundakan 88

The paddy cultivation done in 2008-2009 in the uncultivated fallow land 32.396 Ha (in

Punnayurkulam Krishibhavan area)

Average yield /Ha in rice 5.5 tons/Ha

Highest yield 10 tons/Ha

Different rice growing seasons :-

1Virippu April-May to Sept –October

2.Mundakan September –October to Dec –January

3.Punja .Dec-January to March –April.

Varieties cultivated:-

Puncha:- Jyothi (more than 80 % in puncha in punja season)

.Other seasons other varieties like Kanchana and Basumathy.

Mundakan:-Jyothi,kanchana and uma.

Pests involving rice :-

- 1.Rice stem borer (*Scirpophaga incertulas*)
- 2.Brown plant hopper (*Nilaparvatha lugens*)
- 3.Rice bug(*Leptocoriza acuta*)
- 4.Leaf folder (*Cnaphalocrocis meclinalis*)
- 5.Rodents

Diseases in rice :-

- 1.Blast
- 2.Leafspots

Pesticides used in rice

- 1.Trychogramma japonicum (Trychocards) which is a biocontrol agent controlling stem borer.
- 2.Other pesticides –Hostathion,corrogen,Takkumi,kaldan,karatox.

Details of natural calamity (From 2002 October to 2009 April).:-

(The fifth column in the table –marked remarks –gives the total paddy destruction and also some comments which I have made about the cyclical floods etc of the region,the significance of which will be later discussed in analysis)

Yr/Month	Crop	Damaged area/crop number	Nature of calamity	Remarks
2002-03 October	Rice/Mundakan	75.65 Acre	Flood	75.65 Acre mundakan
2003 July	Coconut	10 palms	Lightening	
2003 Oct-Nov	Coconut ,arecanut	32 3	Lightening	
2004 April	Paddy Coconut Banana Arecanut Nutmeg	0.76 Ha 20 4 13 4	S.W.Monsoon	0.76 Ha paddy
2004 May	Coconut Arecanut Banana Tapioca Vegetables	29 5 13 5 cents 1.26 Ha	S W Monsoon	
2004 June	Coconut Arecanut Paddy	27 2 1.02 Ha	S W Monsoon	1.02 Ha
2004 July	Paddy Coconut Banana	0.9 Ha 2 5	S.W monsoon	0.9 Ha
2004 October	Paddy Coconut	17.044 Ha 21	S W Monsoon	Major loss 17.044 .It is not SW

				Monsoon, pre-tsunami tidal wave.
2005 June	Coconut Arecanut	6 2	lightening	
2006 April	Paddy	17.402+ 1.352+ 4 Ha	Draughts	Major loss Total more than 22 Ha
2006 May	Coconut Banana Arecanut	11 46 15	Floods and winds	
2006 Sept	Coconut Arecanut Banana Nutmeg Cashew Tapioca	21 19 51 1 2 25 cents	Heavy winds and floods	
2006 October	Coconut Arecanut Banana	30 1 81		
2006 June	coconut	7	Heavy winds and floods	
2007 April	Paddy	28.312+3. 856 Ha	Draughts	Major loss total more than 30 Ha
2007 May	Coconut Arecanut	24 3	Lightening	
2007 June	Coconut Arecanut Banana Pepper	82 31 63 1	Lightening, heavy winds	
2007 July	Coconut Arecanut Banana	75 65 160	Lightening, heavy winds, rain	

2007 August	Coconut Arecanut Banana Vegetables	57 35 27 10 cent	Heavy rain,winds	
2007 Septem ber	Coconut Arecanut Banana	41 13 21	Lightening,heav y rain,winds	
2007 October	Coconut Arecanut	9 3	Lightening,heav y wind,rain.	
2007 October	Paddy	7.65 Ha	Floods	7.65 Ha
2008 March	Paddy vegetables	220 Ha 1.25 Acres	Summer rains floods	Major loss 220 Ha
2008 April	Coconut	44	Lightening ,cyclones	
2008 October	Paddy Coconut Arecanut	8.44 Ha 77 112	Lightening,cycl ones and floods	
2009 April	Paddy	167 Acre	Summer rains/floods	Major loss 167 Acres

(The materials in this chapter ,so far mentioned,were collected with the help of the Panchayath office ,Krishibhavan ,and Kol co-operative society of Parur Padavu and the Village office of Punnayarkulam and the references given by them.)¹

Kerala Legislative Assembly Discussions in 1960's

In the general discussion of the Budget (29.June 1960.Kerala legislative assembly proceedings pp 66-670)²,Sri K.G.Karunakara menon mentioned the floods of the preceding year which destroyed the kol puncha of Malabar.And that even after repeated requests the Government could not take necessary steps to help the farmers.He suggested creation of a permanent statutory board to help the farmers of Trichur and Palghat kol puncha farmers in such emergency situations and also the improvement of transport facilities in the area. Calling attention under Rule 66(pp 2692-93 Kerala legislative assembly July 1960)³ he drew the attention of the minister for Food and forests to a matter of urgent public importance. His speech on this occasion is translated as below:-In Chowghat Taluk and parts of Andathode Farkka puncha is destroyed.Doing puncha cultivation requires lot of effort and is a costly affair.People do this expecting a great harvest ,after mortgaging property and gold ornaments and borrowing money .Before harvesting ,the loss of such puncha ,by natural calamities is for a farmer the most dreaded situation.In such conditions Government has to give a helping hand for them.Reducing taxation,giving subsidy etc are immediate helps .About this ,we have given applications both to the chief minister and the minister for agriculture.They sent it to the district collector.Collector sent it to the Tahsildar.Tahsildar sent it to the officer of the amsam (village officer).In this way, there is lot of delay in giving aid in time.When there is a calamity,it is ideal for the ministers to personally visit the area,enquire and do the relief work then and there.That will not only save the people but also make them confident that there is a good governance system which is interested in solving the problems of the public.That itself will be an incentive for the farmer to continue his agricultural efforts .Therefore the travels of ministers for such purposes is more important .

In a meeting of the kol farmers which we convened ,the Tahsildar of Chowghat taluk also participated. But some of the wealthy

landlords ,afraid of loosing their rent(paattam)said that there had been no loss at all,and if the Tahsildar reported according to their word ,they win and the poor farmers cry is forgotten.70 % of harvest had been lost.Even the basis for reducing the tax is still according to the British model.15 years ago,under the British rule ,when we lost puncha like this,they gave Rs 15 per acre .It is deplorable that a people's Government could not do anything at all even after 4 months after great loss to the farmers. The minister should visit the place ,verify by himself and if he so feels give the farmers an amount like a subsidy and to undertake other necessary actions .It is not that by such a small amount the farmer gets back what he has lost.But at least he will have a feeling that it is his Governement and the government is concerned about him and his future .”

In his speech on 23rd March 1962 in the Kerala legislative assembly proceedings⁴ ,Sri K.G.Karunakaramenon seconded the plea for funds of the agricultural minister .He said “ since our nation is not yet selfsufficient in food,due importance should be given to improving of agriculture and make systematic plans for achieving it.Therefore this request is to be commended upon.We have 19 lakhs acres of land which can be cultivated. That we cannot increase as the Honourable minister for Agriculture here explained. Therefore the only way is to systematically plan methods to increase more production using the same area of land available.I request you to have more concentrated efforts on creating certain irrigation projects for this purpose.If we can make a bund in the Vembanaad in Chowghat Taluk ,Mullassery and Pirakkad amsam ,we can convert 1000 acres of land cultivable.The engineering department is making enquiries into this project at present. After enquiry ,necessary steps should be taken for reclamation of these areas for cultivation. Similarly we have to create several development programmes for the kol agriculture. In Trichur and Palghat district there are several kol puncha fields.We

should formulate a kol krishi board for the development of these two districts. It should contain representatives of the farmers and the technical experts. Only then would it be possible to study the problems of farmers directly and solve them. I do not think that the officers do know the problems of the kol farmers at present. If we can connect the kol puncha fields of Chowghat and Ponnani Taluks by a canal, we can get water for irrigating about 8-10 mile long fields. They are at present depending only on rain water for cultivation. In many places like Kaattupaadam at present agriculture depends only on rain water. By making small irrigational projects, more fields can be made cultivable. The government should have due consideration on this fact. Last year, the puncha farmers of Chowghat taluk had great losses because of untimely rains bringing floods and even now they were not given any help for that loss. Four or five months after this calamity, the same loss happened to farmers of Kuttanaad and within no time help was extended to them. It was a good action. But, I am just pointing out the fact that the emotions of farmers whether they belong to kuttanad or Chowghat is the same when a major loss to harvest happens. Why is it that the Government fails to give the same help to the Chowghat farmers remains a mystery. The honourable minister said that it is in the consideration of the Government. I would request to end that "Consideration", and start solutions for their problems. The farmers do not have electrical power and they have been sending applications for electricity. Chowghat and Andathode has been applying for electric power and the Honourable ministers of the department and Electricity had been saying that it is in priority consideration. But still, they have not been given any priority. In the nearby Taluks it is available.

There is a bund in Kunnankulam Vettikadavu and water is stored there. It has not been given to the farmers for irrigation. Only a few lucky persons are getting water from it for the agricultural purposes. When it was asked why the water is not available to others too, the ministers reply was that it is not under his

jurisdiction or control. As Sri N.S. Krishnapillai said, the things are moving like a blind man seeing an elephant. It would be better to bring the related things under a same minister. Madam, I request you to enquire into these matters and do the necessary things at the earliest. I conclude, requesting again that the Government should have priority for the timely help to farmers of Chowghat taluk, for making a bund there and for formation of a kol krishi board. (The above mentioned speeches of Karunakaramenon were sent to me by the former speaker of Kerala Legislative assembly Sri V.M. Sudheeran at my special request in early 1990's.)

2009. August 31. Mathrubhoomi daily⁵ reports that the maintenance and protection of the 100 feet canal which connects Ponnani Viyyam kaayal to Vettikadavu at Kunnankulam is still under the red tapism of the officials and the promises given by successive Governments to the farmers is not yet fulfilled. The 100 feet canal (nooradi thodu) is the major irrigation canal of Ponnani kol fields which is the main rice bowl of the district. It has about 22 Kms length. About 3500 hectares of the fields and their smaller canals get water from this canal. The water from the fresh water lakes is pumped into this and stored there for irrigation of the fields. For most of the kol area of Ponnani, there is no permanent bund. Every year temporary bunds are created by co-operative efforts of farmers and the sand from these temporary bunds erode into the canal during rainy season and decrease the depth and length of the canal. Therefore the water needed for irrigation of the fields cannot be stored in the hundred feet canal. From Nannammukku Srayikadavu area to Alangode-Thelur-Aaalaappuram, the canal is lost due to the overgrowth of shrubs and trees which also reduce the amount of water storage in the canal.

Sri K.G. Karunakaramenon had a project of making use of the hundred feet canal more deep and also pumping water from the freshwater lake to kuttatan paaadam and storing it there and then

connecting the Ponnani and Chowghat Taluka by canal irrigation, and use water of the freshwater lake both for Kol puncha irrigation and for power generation and for water supply to the Guruvayur township. While he planned it the engineering department could not do it because of lack of powerful engines to pump water to the heights of Kuttadan Paadam from low lying Kol puncha fields. Now, the department of engineering has become so improved and developed and it would be ideal to reexamine the prospects of this plan and execute it.

About the red tapism and inability of officials to have the vision of a united India is probably what all of us should be aware of, because in our own fields of service we have to get free from such narrow visions. What my father pointed out in 1960-62 assembly speeches still persists in our midst and unless we are strong enough to be aware of this danger and to overcome it, India as a nation will never find solutions to her problems. It is not the policies themselves which are at fault, but lack of people to implement it with earnestness and honesty what is good for the nation is the problem. As an example, we have a project for making employment. The farmers of Mananthavadi were doing their farming operation when they got an order from the N.R.E.G joint programme-co-ordinator to stop work, through the secretary of the village panchayath. The letter was sent as per directions of the orders of the director of the employment assurance project director. The farmers were in real trouble. They were happy thinking that they were assured of employment. But were asked to stop jobs. They had prepared the fields, had sown and made the saplings and were about to transplant them. Then comes the order saying that such jobs as done (transplanting saplings) is against the basis of the employment assurance programme and should be stopped forthwith. In its agenda the preparation of fields, sowing, making transplantable saplings and transplantation etc does not come. It is equivalent to involving in fields for multiple times. In

Employment assurance project ,one can convert a field that is not cultivated into a cultivable field by just one interference according to the programme joint director's order.If the Panchayaths of the village does help the farmers to do field works as said above ,the amount given has to be refunded also. That will cause insult to the state Government and will incur severe punishment to all concerned. This happened in 2009.

Mananthawadi Block panchayaths did agricultural works including it in the employment assurance scheme.Mananthawadi, Edavaka,Tirunelli and Panamaram panchayaths of North Malabar under the wetland development scheme did this .Due to this ,hectares of land were reclaimed for paddy cultivation in the area.The paddy fields converted into banana plantations in the preceding years reconverted to paddy fields .It was then ,the order was issued stating that the help of paddy cultivators is not under the scheme but under the jurisdiction of paddy mission,krishi swabhimana project,development programmes of agricultural department and not under control of the employment assurance project.Two questions are to be asked.

1.Does the officials know that to convert a uncultivable land to a field ,in a single step operation is not possible at all?

2.By suddenly withdrawing help and threatening a whole group of farmers who had found employment and are doing their share in increasing the food self sufficiency of the nation, are they not jeopardizing the national goal itself?

It is here the question which my father raised in the legislative assembly about the officials and departments seeing the elephant as a blind man comes to limelight.That was in early 60's ,and even in 2009 ,nearly 50 years after our red tapism has not recognized what harm it is doing to the nation.Who is to be blamed for this is not the question.But how this happened and what we can do to solve this problem is the real question we have to address. There is

no point in blaming others. Let us take the responsibility of solving the problem ourselves .

This book is a humble attempt to do so. This book thinks for the nation as a whole ,though it focuses on a special area of kol puncha fields in South Malabar .It also thinks for the entire global population and global ecology ,looking through the window of Punnayurkulam and its agricultural economy and ecology .Punnayurkulam is my microscope and telescope through which I view and predict the subtle and the gross worlds of national health and universal love and brotherhood –through which I see the biological and the astronomical cosmic coexistence of all in perfect balance .

2

Selected Interviews with People of Punnayurkulam

(Selection is based on the relevant information gathered about changing patterns of agriculture, food patterns, and measurement patterns etc which are useful for the present study. Those interviews which gave most information are given in entirety as samples. This was more in the form of a narrative session, so that the candidates could freely express whatever they felt.)

1.Korattikkara Kuttan Nair alias Kesavan Nair .age 66.Traditional occupation.Washerman .The only family of washerman in Punnayurkulam.

Geneology

KunjuAmmam alias Narayani

Son sankaranarayanan and wife kalyani

Son Kuttan nair,wife Sarada (age 56)daughter of Meenakshi

Children Sindhu (31)and Sajeesh (29)

Sindhus children vishnunarayanan and Sreelakshmy.Sajeesh unmarried.

Occupation:Husband –karyasthan ;Wife working in Balawadi as helper (kunnathoor balawadi,Vettisseri padikkal);Daughter L.I.C agent;Son salesman in a medical store.

Informations given:

Olden times for washing one mundu one chilli called a mukkal. Then 64 mukkaal was one rupee.4 mukkal was one anna and 16 anna was one rupee.Therefore $1/64$ part of a Rupee was one mukkaal.For one ser ari,4 and a half to 5 anna.For one mukkaal salt and chilli.Mukkaal was worn on a black thread on the waist in a string like a garland.Now ,no one in the family does alakku (old occupation/laundry).For one raathal sarkkara ,40 Rs.One raathal means 40 uruppikathookam (weight of one rupee) and is measured with a Katti and thookkam(thulas)and the observer can see whether the merchant is cheating in weight.Now we cant understand whether the electronic machines are doing the correct thing,we have to believe what the salesperson say .(we don't know the standardisation)Old days kooli for agricultural labour was Pathukku onnu patham.That means,for 10 para nellu,(which is harvested ,methi,and removal of pathiru)one para is for the labourer. $1/10$ parts.Now no woman does that .From outside Annan(A Tamil labourer).Daily wages 300-325.(300 with food ,325 without)Agricultural labour needed twice a year,and a total of 3 months.The rest 9 months free time women used to do other works like pullupari,(removing weeds) chaanakam koral(collecting cowdung for manure),mannu koral(collecting sand) etc for which

they get 4 Rs a day, Now since they don't do it, annan gets 300-325 daily wages. For a vettuvan kooli for 100 trees is 50 coconuts (which they take as shares by the gang /family/ guild) and for perukkikoottal ,8 coconut each for one person.

The food taken by the family –For children going to school morning tea and palaharam, Noon food rice, curry and vegetables ,sometimes ann omlette. evening tea and palaharam, night again rice. Regular fruits and green leafy vegetable intake is not there. For school children there is noonmeal programme till 5th std. Rice and cherupayaru given .Egg also sometime back, now stopped. (Govt) Even the firewood is supplied by Govt.

Apart from the Baalawadi in kunnathoor one more has started at punnayurkulam (now in Thanka's house) and run by my nephew Krishnan's daughter Usha. Noon meal at Baalawadi is powdered grain, cherupayaru, wheat uppumaa, rice and occasional days paayasam. Sarkara ,oil etc are all from Govt. BDO is in Chowghat Tipusultan road .Maniattan is older .He knows more history.

2. Maniattan (Kunnachaattil Raghavan Nair 78.

Occupation:- From 1960-90 In orissa. 26 yrs in J.K. Paper mills and rest in a suger factory and ferromanganese factory there. Now manager in a cinema hall and in a courier service.

Geneology

1. Erechan nair + Madhaviamma

2. Nannu amma + Achuthan nair

3. Chathunair + Parukutty amma

4. Raghavan nair + Radha (Daughter of cheruvathoor Madhavan nair and

Narayanai).Radha is housewife.64 yrs

5.Latha ,Preetha and pradeep

6th Latha 40 yrs(husband kakooth unnikrishnan)has 3 children Akhil,Arjun and the small one called kuttan.Preetha is 35 and husband Muraleedharan with two children,names cannot recollect Pradeep (32)has one child called sreelakshmy in Ramya and he is in gulf.

Information given:-

Old system of numismatics.3 paise = one mukkkal

4 mukkal = one anna

16 anna =one rupee

Old metric of rice

4 naazhi =1 idanghazhi

10 idanghazhi=1 para

For one Rs we get 16 ser rice =16 nazhi.(Note that tehse are as Logan says in his manual).In weekly chantha everything available.There was sarkkara as well as chakkara.Chakkara is homemade and by women.Thenginchakkara is from pure kallu of coconut and panamchakkara from palm (pana).The pure kallu is boiled and made to a kurukku,(with no other ingredients so that is different from toddy)and poured into a mould.The mould is usually a half of a coconut shell .The shape of the appam will be in the shape of mould.A koodu chakkara is sold

.Koodu means one chakkara with the second upon it as a complete coconut shape .It costs only one mukkalu.We can cut it and use

.Sarkkara is weighed in rathal and it contains chemical,not homemade,and is impure and has more cost.Chakkara used in making several palahaaram Kumbil appam.Take a leaf and fold it to a kumbil.ricepowder and chakkara in it,kumbil is tied and

steamboiled. Ricepowder varuthathu, chakkara paavu kachiyathu and naalikeram chiraviyathu into a ball, Ariyunda

In Orissa jungles the forestdwelling kaada has several tasty foods. When the paddy brings out the kathiru and before ripening when it is full of white milk they take the kathiru and they crush it and take the milk out and mix forest honey with it. They fill a bamboo stem with this, and cover the bamboo with mud, and tie it and then in fire they do chudal. When it is ready, they break open the bamboo, and we can see the palaharam in the shape of the bamboo. They cut it and eat. They eat chutta tubers etc. Even the animal meat they do this. They don't use it as we do. Ragi water is made into a watery kurukku. They then open a round churakka (gourd) and remove contents as we do the koovalakkaya for bhasma, and in it fill the fluid. Whenever they are thirsty or hungry they just drink this, as a multipurpose drink. Along with that they eat kallup, ulli murichathu and a chilli. Each one cultivates the pukayila needed for him in his hut. There are beedi leaves in orissa forests in plenty. When pukayila is mature, it is put in the beediyila and then rolled as a 7-9 inch pipe. They make their own fire. They make from wood, two small dubba (like cap of a bottle) and in each a stone is fixed. small piece of cotton (panji) kept and the stones rubbed to make friction. The fire catches the panji. They keep the roll behind their ears as we do the beedi. In koraput and Malganagiri there is only forest and mountains and only Adivasiss live there. It is in the coast of Godavari. On the other side is Bhadrachalam of Andhrapradesh. There are aadivaasis there also. But this particular culture is not among them. In those days, in our village, in a teashop if we have one anna the stomach will be filled. One $\frac{3}{4}$ for a tea, one $\frac{3}{4}$ for puttu, one pai a pappad was the rate even in 1935. Only four anna is needed for a full meal. In the time of my great grandfather (Erechan Nair) who was the friend of Kannengalath Madhavan nair's uncle, there was no coffee or tea for breakfast. Instead we were given a drink which is njerinjil, malli, and jeera powder boiled in water and mixed with chakkara. In the

morning all drink kanji. There will be pickles and pappad. The stomach will be full. In lunchtime rice and vegetables. In evening, different types of tubers will be eaten after boiling. Night also we get sumptuous rice and vegetables. Once in a way, on a special occasion like a festival etc only meat of goat or chicken will be given. Usually vegetarian food only. Usually everyone travels by foot. To go to Chowghat, from Ponnani and from Veliyamkode we used Vanchi (boat). Our High school was the Pathaayappura of Azhvanchery Thampraakkal. Thampuran comes there only once in 2, 3 or 6 months in a manchal. His food was from Kaattumaadam Mana. The Kaaryasthan will be here. The kothottu, the fields around were all theirs. The thampuran comes and do settlements with karyasthan and goes back. The things are done by Karyasthan and Thampuran comes only occasionally. I studied in Mookkola school from the year when Chithran Namboothiri started it. Till S.S.L.C I studied there. My classmates were P.T. Mohanakrishnan, Kaattumaadam Naarayanan Velakkery Moidutty and Punnayur Baapputty.

The difference from those times and now is that every thing is chemicals now. Those days everything was pure and healthy. And diseases were almost unknown. The reason was the systematic living style. The food habits, the working style and engagement in agricultural labour, which itself is the best vyaayaama. And everyone had the same type of food whether rich or poor. The wedding feasts etc were not so elaborate. The Nair, Namboothiri and Kshathriya were ruined recently because of their adopted lifestyle of luxury later on. The daily life was very simple for everyone. Brahmins had vaaram, othu and pasudhaanam. Some gave alms for fame and got ruined. Now the lifestyle has changed. Luxury has become the rule of the day. And no one gives anything to anyone. The attitude of the people is totally changed.

In those days the women had 10, 12 and even 15 deliveries. It is true that some died in infancy and only a few survived. Still the delivery

was normal and without medicines or manthra. Food and other nutritious raksha were given. The santhathi to continue the race was kept always. 40 days were the time for the delivered woman to get care of special type with which she regains full health. This 40 days includes the few days before and after delivery. Now delivery and pregnancy is treated as a disease. The house is converted into a pharmacy with costly chemicals. Number of children are less. And death rate also less. But the infant mortality rate is higher and sometimes the races end with such practice. Before we used kurumkousala and ayurvedic paarampariyavaidya, and these were done at home itself. Now nobody knows these small homely village medical practice and everyone rushes to a doctor and get medicines worth Rs 300 per day. No one knows the side effects, yet they take it with faith. The doctors also don't know with what the relief came and they give 3-4, a list for even a small problem and make us ruined economically. The disease will remain and the money will be gone for nothing. In some houses aasava, thaila, were used daily and daily bath morning and evening was done by all. People were conscious of cleanliness and daily bath in a tank/river. Each house had a tank and well and there were public tanks and well for the entire village too. Now people do not take regular baths and just apply some smelly creams and pretend they are clean. No wells or public tanks. No private ones either. All gone. Previously we had curry with manjal to ward off several diseases and we were all healthy. Now it is not common. People add masala to every curry and has become unhealthy. I am still healthy. But my wife is not. She is a patient in Amritha hospital. Daily 100-150 Rs have to be spent for her treatment. I don't take allopathy medicines. I don't get illnesses. Even if something comes I take only village medicines. With that I become healthy and no cost also.

Houses.:- The low and intermediate type of houses had clay walls, and thatched roof and the floor was of mud and covered with cowdung. This type of house was suitable for all types of climates

and even if there is destruction in natural calamities it was not causing much economical loss and it was easily rebuilt with materials in the locality by co-operation of the people themselves. There was a great storm with strong winds in my childhood. All coconuts, trees and immature machinga including, and all houses fell. There was no one to take the coconuts even for one paisa. All coconuts were down. But no one had hunger and there was no famine and every one rebuilt house with least economic problem. After that, 65 years back a famine came during British rule. Not a single grain of rice to be obtained. The greedy people tried to soak the rice in water and sell it making extra weight for extra money in black market. People had become greedy and selfish by that time. No more co-operation between people.

I have kept my S.S.L.C certificate even now. That was issued by Madras, and Andhra university combined. Both were under a single rule and the Governor was same. From Arabian sea to the Bay of Bengal we were a single state. Only Cochin –Thiruvithamkore were separate. In Ponnani and Mangalamkunnu the large ship called Pathemmari will come. The ships will be at a distance of 3 Kms from the seashore. Small boats will go and bring things from them ashore. From Tirur, Thanur to Naattika (now in Trichur) was a single one called Ponnani Taluk. It was in the district of Kozhikode. At that time Arakkal Bappuhaji was our DEO (district educational officer).

I remember an incident which I regret now. It was a misbehaviour in my school. The history of it is like this. In those days there was a tank, pathayappura and oottupura attached to Vaalaadathele kalam. There we get rice and curry for about 50-100 people every night. Koladi Unni without his uncle Appunair's knowledge used to help people of the communist party there. At that time Govindan kutty is not in the party. He was a late comer to the party. Imbichibawa and Unni were leaders. Chithran Namboothiri as a student was having leftist ideas but left politics later on. His friends were Balan, son of P.B. Nambiar of Guruvayur and Neelakandan Poomulli.

Chithran Namboothiri taught us English in school. When these two friends come he will leave the class. Nilambur Kovilakam Kunjettan Raja was headmaster. He taught Geography and was very orthodox.

We did a strike in school. Actually we were not doing the right thing. At that time Hindi was made compulsory. A Hindi Pundit came from Kondotty to teach us. The students did not like his style. They will take small stones and fill the pockets. And throw them at him. The stones come from all directions. I was in the B section. Little EMS was the CP general secretary Ponnani. The teacher was angry. He complained to the headmaster. Headmaster came to class and found the stones srewn all over the class. He asked to stand on the benches. We obeyed. But at noon interval we had a meeting and decided to put all benches outside the classroom and did it. There were only desks in the class. All students were send out of class. Next day we all stood outside the gate. No student was allowed to enter school. Two days went like that. The third day Chithran Namboothiri called us to his house. We made a demand that the Hindi teacher should be changed. Or he should ask for pardon publicly in the school assembly. We got our way. The fourth day he was made to apologise in the assembly. It was really hard. We had no reason except that we were envious of his style of dressing and for that we stopped four days of class and made him humiliated. Now I know we were wrong. But when we did it, I didn't think this way.

3. Dharmapaalan .62 yrs

Geneology :-

1. Unni

2. Maakkotha

3. Karappan + Kaali

4.Velayudhan +Kalyani daughter of Kaalikutty

5.Dharmapaalan +Bhaanumathy

6.Two children Dhanapalan and Dhanalakshmy (She is Hospital administrator at Amritha Institute of Med sciences)

Occupation of Dharmapalan –Jewellery shop and agriculture.He is a local political leader too.

Information given:-

In olden times if we give two coconuts we will get one naazhi rice (barter).Now for one Nazhi rice,the price is that of 10 coconuts. Before,by what we get as wages ,the labourer could get one naazhi rice and all the household needs .Now the prices have gone up. After purchasing everything ,the excess money is spent on luxuries.Now ,even if there is land agriculture is impossible because the labourer do not work and the landlord cannot make them work.Thus we have lost the agricultural habits.This was due to the sideeffect of the land reform which had several drawbacks.

In those days of barter to give one coconut or 4 coconuts in a shop for exchange of things was not a shame .Now it is considered a shame .If we take two kula plantains to market we can get everything we want just out of its selling price.We used to grow them.Also we had different types of gourds,pumpkins etc grown .During Vishu season we used to sell it at Poozhikala market in several basket loads.Now the youngsters think that doing that type of work is a shame.

In the month of Dhanu we put seeds of Vellari (a type of gourd)At that time ,there will be Ayyappan vilakku at Urulimmal,in front of the present Registrar office.That is on Dhanu 10.The Mandalam 10.It corresponds with our time of krishi.At that time ,we children and their parents assemble at Patterippadam.We start making

thadam for our seeds. There would be a healthy competition about how many thadam one did and how much he /she Produced. Each family competes with the neighbour in this and it was fun like a play. (Here my brother Asokan interrupted and said, He and his sister Sudha with children of Anchakkal Leela, Saradha and Jaanu used to do this). We ,our family used to make on average 40 thadam ,one will be for kumbala and another for padavala for our own domestic use. Father and mother used to do more than us, children. Katari Moosa and family used to make 100-150 thadam.

At that time Patterippadam never had the problem of the salt water coming into it from Arabian ocean. It is in direct contact with Nalapat fields, Eechi fields behind Poozhikkala market, and Canolley canal. After Canolly canal construction, through it, and Chettuva area, salt water reached here. The Valayamthodu, and veliyamkode cheerpu for protection were broken. The valayamthodu cheerpu is for preventing the salt water to raise to the fields from sea. The Veliyamkode cheerpu is for preventing the fresh water to be drained to the sea. When these were gone, salt water entered fields and fresh water was lost and agriculture suffered. When the water from Chettuva ,without entering the Enaamaakkal kaaayal, comes through Cannolly to Ponnani ,the salt water will enter our fields. We were doing everything as samudaaya on co-operative basis. For festivals we take money on interest basis as loans. The mathematics of Naanu the one who gave us money was something special. He used his body organs for his calculation .For odd numbers he show mouth, nose and for even he shows eyes, ears etc. If he say ear and nose it is 3 .The measurements were with instruments like

1. Kuzhil

2. Sodhana which is like a cheppukudam and can hold 5 to 6 litres

3. Mahani . $1/16$, $1/4$ kaalu, $3/4$ mukkalu and $1/8$ arakkalu

4.Vellikolu.An instrument for weighing paper and metals.The principle is the same as that of the platform balance(pettithulas)and common balance.

4.Kunjippa 57.

Geneology

1.Seydumohammad

2.Mohammad+Fathima

3.Kunjippa+Ayisha

4.Children are Renish(Dubai),Remina (married and has a child),Reheed (B Com

1st year)Rijash(2nd yr)

His experience about the agriculture is identical with that of Dharmapalan except that he did his share of krishi in Veluthepaadam.

5.Cho Mohammadunni 58.

Gulf returned. I am called Cho because in my school years my friends thought I resemble Cho,the actor and they nicknamed me so.It stuck.There are different types of krishi.One is vattam krishi .It is just one maturity(mooppu).When the rains are over harvested in summer .Then comes the festival season.

Vattam kuttadan:We have to do it before the rains.

Vellappokkali:-In Cherayi,Kuranjiyoor and Punnayur .The paddy will be always above water .So the name.We can go in a boat,and harvest by dipping under the water .In the fourth stone,the east fields of Manikandeswaram,vattampaadam is harvested during

Makarachovva.(Northern solstice period) In kadikkad it is iruppoo(two harvests) Kadampully to Kuranjiyur is kuttadan. In koyappulli kaayal,thavalakkunnu,paroor kaayal,Thendan thara area used to have three harvests of pokkali Now it is not done.It has stopped for about 40 years from now.

The reason for end of Pokkali krishi is mainly lack of expected yields.By strong rains when the plant is broken and fallen down the yield is less. Thavitta is a similar plant to pokkali and it is difficult to distinguish them morphologically.The seed we usually use is the Thavalakkannan.The new ones are Thainan 3,IR 8,Jaya and Annapoorna.

The agriculture in Manchira was improved by your (my) father.Veettila vilappil Chekku Haji (called Thainaan Chekku Haaji) was selected by the then Govt as the best Karshaka (farmer).Your father did IR 8 krishi in Nalappat Fields as a model field.With the subsidy from central Govt ,IR 8 harvested nooru meni(100 %).It was with your father's personal initiative that the first Methiyanthra (Motorised mechanized thresher)was brought here first and Panmpalli Govindamenon did its inauguration.It will separate the mature and immature paddy.(kathirum pathirum).The first experimnent was done in Kerala and that was here,and it was 100 % success.

After vattaom krishi,in the same fields we have different types of gourds etc(matha,vellari,kumbala,kaypa ,padavala etc) for vishu and we need not buy anything from shops.We were selfsufficient and can sell the excess.Now,for vishu,we have to depend upon others.Nothing is grown here.The awareness about agriculture should be given extensively to change this situation.It is not something to be ashamed of.Development has happened and it is good also .Gulf money is there which is the purchasing power of people.But we have lost all the ancient knowledge and it has to be given awareness of.No tanks are seen .The old tanks like

Mooppadele, Mullathele, Kotteppaate, Knjikaazhi, Pattare, Kottele, Vanniripatte, Kannanikulam, Aishaathaakolam have totally disappeared. Some have partially Disappeared .Poozhikkala kolam is lost. Even the old pipe is not seen. The 3 ½ cent land which Kunjunnimenon (Ambazhathele) donated for it was taken up by water authority and a tubewell, tank and pipe were there. None of these are seen now. Bal T Vannery was appointed as the last operator. The inauguration was with aarppuvili and lot of pleasure by the people. Somewhere between Althara and Attupuram that pipeline must be still lying underground as an archeological relic. There were songs for each occasion like planting saplings of paddy, harvesting etc. None of them is now prevalent. Suku was a good farmer 25 yrs back before he went to Gulf. Now he is not doing any agricultural activity. Suku is not doing agriculture in Valladithodu now. At this stage the conversation turned out into a group discussion in which Suku, Cho Mohammadunni, Dharman, Asokan and Krishnan were participants.

The suggestions were

1. Let the developmental and economic welfare due to Gulf impact and purchasing power continue.
- 2 At the same time give awareness to next generation about agriculture and its importance and the peculiarities of this part of land (regional peculiarities and possibilities).
3. Let them not feel ashamed of doing agriculture to make themselves selfsufficient in food requirements.
4. The protection of the wells, tanks, canals, and other natural and constructed water bodies for agricultural, economical, irrigational, water conservation and ecological reasons. The ground water protection depends upon them as well as the rain water conservation for use in agriculture and for other purposes.

5.Drip irrigation facilities will be of use for conserving the water thus obtained.The songs of farmers were recollected by some of them.

1.Puthooram veetteennu ponne pinne
Velapooraaadhikal kandittilla

2.Naathoone Naathoone kaalil chavittalle(women wearing thoppikuda during transplantation of paddy)

3.Janakante makalalle cheethappennu
Avalalle raavanachan katthukondoye etc

6th Interview with Nalapat Asokan .Age 55.Farmer,does smallscale business and runs a local cinema hall for livelihood.He is my brother.(Family tree of Nalapat Asokan from 1790 known. He is secretary of Parur Padavu Kol krishisangham .

Asokan:-We use machinery here for agriculture. We have the improved ploughs,power tiller with rotator,and the large wooden levelers (maram/mutty)kerosene diesel engine pumpsets, electric motor pumpsets ,knapsack sprayers,and power sprayers,and mechanized thresher(methiyanthra).We do not use the paddy weeder .We have pallimuttu which when rotated makes all the weeds crushed as the organic manure.Last year mechanical transplantation was experimented Justin two pieces of fields .It is not yet done on mass scale here.

The different farm operations are ploughing(uzhavu), Irrigation (Jalasechana),Transplanting(Njaru parichu nadal),pesticide application(keetanaasini spray),weeding(kala pari) ,Harvesting (koythu),thrushing(methi),Winnnowing(umi neekkal in kaattu or wind),processing (puzhunghi unakki ,kutthy ,pathaayam nirakkal) which involves parboiling ,drying ,and mortaring and filling the

granary. At present the processing is not done in homes. We straight away take the paddy to the mill and processing is done there. The reason is scarcity of fuel and the scarcity of the labourers and the cost of labour.

The most difficult is to get labourers for harvesting and thrashing etc. The machinery are available in the Panchayath, with the Krishi committee and also with private people on a lending basis and even from Tamil Nadu we get it. From the panchayath there is a subsidized rate and because of the number of applicants and the delay in getting the machinery in time most of the time we will have to depend upon private machinery which is expensive. If we wait for the subsidized machinery when the climate is precarious, the precious time will be lost and there will be loss in produce and so people get machinery in time from private sources and this naturally increase the cost of production, and at the end of the day, the lack of gain in agriculture is the increased cost of production.

Another important problem is the transport of large machinery to the fields. Before the rains start we have to finish harvesting, otherwise the entire field will be under water. Or the road will be under water. Therefore no one can wait indefinitely for the subsidy. The rotator alone is easily transported, because it can be transported in a boat also. All the other machinery has to be transported along the road and it is under water when rains come. In Kol puncha it is one pooval as summer crop. There are possibilities of doing two or even three pooval and making use of mundakan (kuttatam) also. The three pooval are in Autumn, winter and summer. If we can store water, we can do three pooval and the kuttaadan /vattanilam can be made fertile and used for agriculture again. We have a Kol padavu committee. The total area of kol puncha fields as wetlands in lakh hectares in entire PKDA is 3000 hectare or 10000 acres. There are about 100 padavu. Parur padavu is one among them. It is about 900-1000 acres. Punnayurkulam padavu is 200 acres. The several padavu extends through several

villages .If we take the entire kol puncha fields from Ponnani to theTrichur area as a necklace ,the parur padavu is the pendant of it,according to our father .(He showed the entire area,and also demonstrated by drawing a map of it to me.Our father Late Sri .K.G.Karunakaramenon used to say this simile ,he told me.)

Apart from rice there are other produce.We start planting pepper by the Thiruvathira njaattuvella and within two years the plant starts giving the yields.Coconut once planted give yields in every season throughout the year.Plantains are planted in Vrischika .Mango,jackfruit,ayini chakka,nelli,tamarind ,and other fruit trees are grown and have fertile soil here for them.The cashewtree (paranghi maavu)grows well in the coastal belt.Ginger,arecanut, different types of pulses ,pipervine ,oilseeds etc are present .The soil is useful for doing maracheeni krishi also but usually not done.We don't have tea here.Coffee plants are seen very occasionally only.We don't do rubber here.The pulses are sown in June during the Makayiram Njattuvella.The different types of gourds are available.Then roots and tubers like chena, chembu and kaavathu etc are grown.We don't grow sugarcane here.The crops are all sustenance crops mainly .Several medicinal crops like thulsi,Manjal,adampu etc naturally grow here and koova during the Dhanu season(Thiruvathira)is a special nutrient. The other jobs like animal husbandry etc also are resorted to.But now people have lost interest in that.Previously in every house there were cows,and ox for agricultural purposes,and very occasionally goats and cocks and hen too.Now Cow is looked after by Anchakkaaln family ,Vellamackal,and Imbranghattel only.No one grows fish now.But there is the coastal people who live by catching fish from the sea as before.With the disappearance of the tanks the fishgrowing also came to an end.The old families of traditional occupations are still here but many of them have stopped doing the old traditional jobs.

There is a karuvaan family(ironsmith) still in Ilambanakkat thaazhath. The Thattan family(goldsmith) consists of the present generation like Krishna, Bhaskara, Prabhakaran and pushpakaran, and sreekumar, sankaranarayanan etc. (They are actually four branches of the same original Thattan family of the graama). Aasaari (woodworker) family is the kalloor branch with 6 subdivisions of family of Chinnan, Theyyan, Appunni, Velu, Krishnan kutty and One at Govindapuram.

There is no moossari (brass work) here. The kollan (who does the leather works) is at Althara and it is the old family itself. No one now does the weaving of kotta, paaya etc. That occupation has entirely stopped here. Most of the labourers here are now masons. And many construction workers have come up from the old traditional families. People are mainly involved in trade and commerce and agriculture is now of secondary importance here. The manufacture of Dhanthadhaavanachooram by K.P. Namoothiri is one of the famous industries related to Ayurveda here. The processing, servicing and repair of industrial and household articles is there. The civil supplies department is the storage and godown and redistribution area for us. We don't store rice in homes in pathaaya as we used to do before. Communication with post office, is available. The sub postoffice(1), branch post offices (6) telephone exchange(1) and a private computer center are available. Andathode registrar office is 100 years old. The police station is now near it. There are two primary health centers one at Mndalam kunnu and the other at Vadakkekad.

The Punnayurkulam Co-operative service society is active still. It was the work of our father to establish this here. There is a village office and a krishibhavan functioning here. PKDA is Ponnani Kol development Authority which is in charge of entire kol field development of the area. I am now in charge of the Parur padavu committee. We have given a detailed report and a request to improve our conditions to Minister of agriculture of Kerala State

and are awaiting his reply. (The copy of that letter was given to me for perusal)

These six sample interviews are given here for the reader to see the current problems as well as the awareness of the local regional people about the conditions. This is the real subaltern history of Indian people. They were never ignorant fools but knew their conditions and agroecocnomy and geographical peculiarities very well and were a welladjusted self supporting group who had all the benefits of a good produce and the means of organized trade and commerce through a protective system of law and order Only thing is that it worked on regional basis (since India is having varied climates and conditions of produce)and all such decentralized self-sufficient small republics were linked by a organized trade supported by protectors and lawgivers in a centralized administration .Both centralization and decentralization simultaneously followed in such a system of existence and unless we understand this ,we will go on having separatist ideologies amongst us and make the divides more and suffer. Once we know the oneness of all ,this will be lost and co-operative ecological existence is still possible for all living beings under this planet earth.

3

My reminiscences of Punnayurkulam

I lived in Punnayurkulam from 1946 (my year of birth) to 1965, till I left the village for Higher studies ,as a medical student. The initial nineteen years of my life was spent in Punnayurkulam and in a study of the area, my reminiscences would not be out of place. I was born in to a family of thinkers/philosophers/poets /authors /and freedom fighters/with strong Gandhian ideology. My father

was primarily a farmer and he had graduated from Madras University and took his law from there. He was a follower of Indian national congress from his student days and Gandhi and Kamraj have influenced him greatly. He was attracted to politics by these influences and when he returned with his B.A.BL degree to his native village, he took to agriculture and politics as a fulltime occupation. Therefore, I had seen and experienced the struggles as well as the beauties of the ordinary farmer's life in the village. When the time for agriculture comes, and when there is impending rains etc the urgency of money and procurement of necessities become great my father resorted to the following methods to tackle them.

1. The ornaments of the wife and children will be pawned and after the harvest they will be taken back
2. There were some thing called a changathikuri (changathi means friend and a kury means a chitty. In Sanskrit it is a sangha or guild and sanghams existed in India from at least before 9000 BC according to the preface to Thirukkural by Dr N.Mahalingam). A Sanghaatha or Changatha is an association of things (like two or more boats tied together) or people who work co-operatively as a single whole for a specific purpose. He will invite his friends and wellwishers and provide them with food and the friends will give him a small envelop which is their donation for the cause. The friend in turn invites my father when he is in need, and he has to return it. The envelop contained money as a loan, without interest offered as a gift on a co-operative basis by the entire society to any friend in need. This was a regular feature of rural life in those days. People were co-operative and helped each other, not with any greed for exploitation. (as it is now with a huge amount of interest, even in Government run banks). Later on I read in William Logan that this system existed in entire Kerala as an ancient system of co-operation between people and rulers.

3. The next source was selling coconuts to Vettisseri, a rich Muslim in North Punnayur and Vettissery sometimes gave him money, in advance before the coconuts were ripe. The problem of labourers was not there in those days. The barter being in vogue, everyone was ready to work for the sake of earning rice in return for the service. The same rule applied to all other occupations in the village. The special rights of several people (like the washerman, the bard or paanan, the leatherworker and the agricultural labourer, and the people who bring household articles of wood, mat, baskets etc) were this service for barter. They come to collect it on special days sometimes with ceremonious dress. The festivals also had the special rights of all the village people, earmarked for each. Both men and women worked co-operatively in the fields and there was a division of labour in this

too. The heavy jobs were done by men and the transplantation, winnowing, harvesting, processing etc were mainly a woman's job. And there were special songs of women for each of these so that they do not feel tired and enjoy the job. The village was functionally divided into two, one on the left and the other on the right of the Eliyanghattil Kovilakam which is the central landmark of the division. The people on the left side get services from the families of the special labourers and occupation who live on that side. And the right side vice versa. Both were under the Kovilakam and has rights with the kovilakam on special occasions. My father's house was on one side and my mother's house was on the other side of the kovilakam and very close to it, and we had been in touch with both the people because of this. The paanan, aasaari and parayan, veluthedan and mannan and the panikkar (jyothsyan) of the left and the right side were equally in contact with us, because of the maternal and paternal position of the houses.

The main agricultural help in my Mother's house was Krishnan and his consort Vally, and after them their son Anchakkalan. Both Krishnan and Vally wore the same dress as my great grandmother wore. Just a mundu (white cloth) around the waist. Krishnan was

very old when I was an infant and had his hair done to one side (Therefore he must be of the Vasishtagothra according to Vedic categorization) and had long earlobes with red kadukkan(ear ornament)in them and almost all the males of that time had this .My granduncle also had the same hairstyle and kadukkan in his old pictures but later on(When my grandmother married from Chittanjoor kovilakam ,my grandfather was wearing a shirt ,and he influenced granduncle also to do so.My grandmother also started to wear a blouse after that wedding) he removed kadukkan and started to wear ashirt. The women who came to assist in the outside jobs and agriculture in my fathers house were three. Kaali,Aacha and Kaakki were their names. None of them wore blouse and was just wearing the loincloth like my great grandmother did. Even the Ammathampuran,the eldest of the royal palace walked like that ,so there was no discrimination between the lower class and higher class in dress ,or food .Kakki had a small piece of cloth hung over her chest tied at the back of her neck. The women helped in the processing of grains and in all other matters regarding agriculture. Their entire family were helping us in performing the agricultural functions on a co-operative basis.. Despite difference in class and so-called caste(which is a new term as far as I am concerned ,because we never had that concept in those days) all were having same dress,same food habits and same festivals and same problems and same solutions and this was a feature of unity which was achieved through co-operative agricultural activities which lasted for several millennia in India. And no one had money /cash with them, but had everything they needed by the co-operative barter system only. So ,the Kooli though it was less in cash, was more in kind so that all could enjoy products equally. Whatever is grown in one's fields or home garden lands goes to all by sharing, barter and customs were devised to ensure this. There were some special occasion when the rights of certain temples had to be given.We had a Thaalam at the Punnayurkulam ,from my mother's family, and each family have it on a special day and there is an entire village thaalam

(naattuthaalam) which is contributed by the entire village. In our family, apart from this we had to give tribute to 4 temples, two for my father's and two for my mother's. They were Kozhikulangara, Chirakkal (these two were for Nalapat) cheruvarambathukavil, Annamkulangara (These two for my father's house.) The para (the representative of the temple and its devi) will come at the specified day and a specific measure of rice and articles are to be given to them. This was an ancient type of levy on land by the government. That is how the temple activities were maintained partially. At present Chirakkal para is not coming since the system automatically stopped there. The other three still comes to my brother and gets their ancient due. That is, we, as subjects of old kings, have not stopped paying the old ancient system of offerings to divine and Government (royal) treasury of yore though it has lost its administrative role.

In historic and prehistoric India all people, kings, rich merchants etc did Devapoojana or Devayagna to accrue Punya but also to maintain a social co-operative system alive for benefit of all. The various temple constructions and cave and temple land offerings etc seen spread all over the land with inscriptions are actually due to this widespread habit. The very fact that entire Indian subcontinent had this co-operative structure, and extended this even to other nationals (like jews, Christians, Arabs etc who came here as merchants) shows the solid unified administrative strategy though there were several small kingdoms existing as simple Republics. Each was self-sufficient in its own right. The food was simple and delicious and always homemade in Nalapat, my mother's house. There will be rice, dhal, a vegetable curry and a thoran (vegetable) and curd with some pickled fruit. We ate all fruits available in the garden of ours in their particular season, and never sold them. All neighbouring children could share the fruits when the season came and there was no discrimination between class or caste in that, especially in my father's house. And the animals and birds and children of the village had their

nutrition and fun time together under each fruit-tree in turn according to season. Medical facilities were not there. The ayurveda and home medicines were known to all our family women including my own mother. I remember an occasion when I was beaten by a scorpion, at night, while I was sleeping on floor. It was pitch dark and my mother took a torch and went out, and came back with a green leaf which she crushed and made into a green juice and applied it on my arm. The pain and swelling were gone. She said it was adampu, specific for poisons. For a thorn struck into foot she applied ground boiled rice and turmeric on a piece of cloth as a poultice and left it in position for entire night and day, and when it is removed the small thorn stuck on to the paste in the cloth. Similar and very special medical things were known and the cost effectiveness and lack of side effects were noteworthy. My mother knew all the medicinal plants and could identify each with precision. The seasons, the calculation of time etc were known to my grandmother and great grandmother and they knew the land and its peculiarities and the ecology of existence well.

My grandmothers had been doing panchamahayagna. They did daily swadhyaya of scriptures (Brahmayagna) and pooja (devayagna) and welcomed the guests and others and gave them food and shelter (Athithipooja-manushyayagna) and had a athaani (for the loads to be put and for rest of people who go to markets with heavy loads) and a hut (thanneerpanthal) erected at the corner of the road near our house. There one can get the cold whey mixed with curry and lemon leaves and salt for free and keep the loads (on shoulder or in a kaau) and take rest and go. This helped all the passers by (saarthavaahaka or people traveling with their loads to distant places). And at night grandmother lighted a lamp there so that the passers by get light. What the Government is doing now, each family had been doing in ancient times, I suppose. The custom of giving food to animals, birds and even ants was

encouraged(bhoothayagna)and the family followed ahimsa (nonviolence)to the core and were totally vegetarian.

My father was not a vegetarian. But all the other habits described above were in him.He had a strong social sense.He became K.P.C.C.member,president of Palghat D.C.C,and was elected as member of legislative assembly from Guruvayur Niyojakamandala in 1960.He was for a long time the deputy leader of the congress parliamentary party of Kerala legislative assembly. He had also been the Panchayat President of Aattupuram,President of Vannery Educational society,President of the Kol krishi co-operative society, Executive committee member of the Palghat district urban co-operative bank and his services and contributions to the co-operative movement in Kerala was great(Ref 9th meeting of Kerala legislative sabha .1993 July 23 .Speech of Sri P.P.Thankachan ,Mr. Speaker).He was also the chairman of the Palghat district Bharath sevak samaj.When we discuss the kol pancha and agricultural reforms of the first three five year plan periods ,the role of him in community development and agricultural activities for nation-building in the Nehruvian era will be seen.One of our informants Cho Muhammadunni remembers his activity in the seashores where he organized help for the fishermen, agricultural labourers, poor masonry workers,etc .

There were regular feasts for the poor people on our birthdays and on death anniversaries of his parents at our home.The wandering tribes (aadivaasi)of naayaadi knew these days by heart and they came for all these without fail.Sometimes I have wondered how do they know the exact day ?Because it is with a lunar calendar ,not based on the date ,these are done. It simply shows the fact that even the wandering tribes(whom modern education picturise as illiterate)were really literate about the earth and its laws of lunisolar behaviour,seasons etc.It is not degree alone which matters ,but real knowledge is the understanding of the surroundings,the land we live and its relation to seasonal changes etc .Without that,all other knowledge is useless to any nation.Nowadays

students are taught about the political reforms of state and center and about the royal wars and quarrels between religions but nothing about the nature ,geographic peculiarities and ecology of their own nation and the world and how that influenced our history .Learning about quarrels of history perpetuates quarrels ,and we should learn how to learn co-operative habits for sustenance of all races of animals,birds,plants and human beings .

It was in 1958 that the Punnayurkulam Kolkrishi co-operative society was started and Janaab Chekkumusaliar was its first member enrolled.(His son .V.P.Maamu later became Panchayat president)In 1961 this evolved into Punnayurklam service co-operative society and my father was its first president.Using the funds available from the Palghat district co-operative bank, and the grant from the Government,the introduction of agricultural loan for farmers was done from that period and was successfully done by him.In those times Punnayurkulam co-operative society was one of the best known models in the entire district and the entire state of Kerala.And the godown for storage of grains and a own building for the society came up in that period itself.(It is still seen in the Ponnani-Guruvayur Main road).There had been central and state co-operation when Nehru was the Prime minister. And the necessity of training people to continue the activities of the present leadership came up.Then my father wanted to train people for the co-operative banking from the same region so that they will continue to do good work for the region. He had made it possible for Mr Gopalan(one of my classmates) to undergo J.D.C training (Junior Diploma in co-operative training)and he was appointed in Punnayurkulam bank. Similarly Mr. Venugopal was given training to function in the Palghat Co-operative urban bank and both have been working for this cause since then.Mr Gopalan writes about his contributions to bringing telephone and electricity to Punnayurkulam,Vadakkekkad,Punnayur,Perumpadappu and

Veliyankode panchayaths ,in a memoir to him,published in 2007 ,on his 14th death anniversary.When my father sent me to Medical college he had a plan in his mind.He thought,I can set up a small free clinic in the village itself for the people and also do work for the Guruvayur Township where a Hospital was constructed.He had written about this to me ,as soon as I began my house surgeoncy. But, women are (after marriage) more dedicated to the wishes of their husbands and my husband did not want to remain in the village and we moved to Calicut But ,we could help the villagers there also ,and father used to send all the poor people in need of medical help ,and reference cases to my husband and we could do that.People are the same wherever they are,whether in Punnayurkulam or Calicut or anywhere else in the world. One can help them if one has a mind to help.At present my youngest brother is the President of the Kol krishi co-operative society and he is trying to follow his father's footsteps in his own way.

We had only a lower primary school in Punnayurkulam while we were children.And there was an area which is Muslim predominant and cut off as an island without roads in the middle of the wetlands and the waterbodies and without any facility for the students to learn. My father worked hard to make a primary school for those boys at Uppungal thuruthi ,the cut off area,and also to make it possible for all children of the area to have free High school education .He himself had to walk upto Kunnamkulam to get High school education which is very far off without any roads and vehicles in those times.So,he was aware of the difficulties faced by our people in all fields.With his effort he built up the Primary school at Uppungal and the Vannery High school at perumpadappu (in which I studied) .Vannery high school is the only high school which gives free education to all students and poor students who have no facilities to go to private schools still learn there.

The Punnayurkulam I remember through my father and his friends ,does not have any caste ,creed or class differences.My father was

a leader of all. A person who had a unified vision. But, now, Punnayurkulam is said to be in the police list for intercaste rivalries and crimes, tells some top level police officials. That makes me sad. But when I go there I do not find such tensions and we are all still friends and I cannot believe that such communal tensions exist in that village where people are known to each other so well and are friendly. But one cannot ignore the police records either. The serene friendly atmosphere is still there. The people are still friendly and loving. But something is lacking there. Is it the old warmth of unity? The feeling of oneness? Or the lack of a leader like my father which is essential in every village ? .

Because the leader is only the one with a comprehensive co-operative spirit and one who understands the unity of all human beings alike. We are in need of such leadership to solve our problems. I can only pray to God that the people of my beloved nation be given wisdom for a peaceful co-existence and mutual love for each other. Let each village and town and city, each nation see the necessity of a co-operative, compassionate existence on earth, friendly and in peaceful co-existence so that all of us prosper together and in this way let the entire world prosper and be peaceful. Through individuals, through society, and through each region and nation let the world attain peace and prosperity, a balanced ecological existence. This is not my dream alone. The dream of all my ancestors. The dream of Gandhi, the Father of our Nation, and each and every sage and Rishi of yore !! The dream of India for entire world !!

AGRICULTURAL HISTORY OF INDIA

We will divide the agricultural history of India into four periods ,for easy understanding of the changes that occurred over the years.

- 1,Prehistoric period upto BC 500
- 2.Historic period from BC 500 to AD 1400-1600
- 3.India under foreign influences From 1600-1946
- 4.Independent India –After 1946 till now.

Then we will see how the history is continuous from early prehistoric to the present times.

In regional language agriculture is called Krishi.What is Krishi ? Krish means the earth.Whatever is produced from the earth is krishi /agriculture.Incidentally Krishna also has the same root ,meaning ,the ecstasy of the earth¹. Bhagavad Geetha² classifies krishi along with goraksha and vaanijya(protection of cows and trade and commerce) and Koutilya in Arthasasthra³ also groups it under vaartha/vaarthika or economy along with pasupaalya(animal husbandry)and trade (vaanijya).These are the jobs of the vaisya (in chaathurvarnya) and from 3200 BC to 500 AD (From period of Krishna and Vyasa to period of historic Chandraguptha and Koutilya it has remained the most important part of Indian economy .(Ref .Mahabharatha V1 ,40,44 =Bhagavad Geetha XV111 ,44, and Arthasaasthra 1,4,1)^{1,2,3}.Amarakosa has made a distinction from krshi(agriculture) and gleaning (unchavrithy or seelavrithy.) (Refer Amarakosa 11,9,2)⁴.Mahabharatha says it includes collectively all activities related to agriculture like ploughing,supply of seeds,implements,animals and human

labour(MB 111.1,26)⁵.In pasupaalya, aswasasthra,gajasasthra ,gochikitsa ,koopavidhi and thadaakavidhi(establishment of wells and ponds) are also included by Kasyapakrishisookthy.Seeragnana (knowledge of plough) and seetagnaana(knowledge of the ploughfurrow)are connected with Janaka and Sita in Ramayana period to Balarama in Mahabharatha period.And these are explained in BC 500 by Koutilya(Arthasasthra 2,24)⁶.Nyaayamanjari Ahnika 64 ,Ahnika 4 says⁷:-

Phalavedaatthato gnaathwaa naagavarshasya vaarakam
Thasya poojaa prayokthavyaa bhakshyabhojyapurassara:

(Having known the year of the naaga or serpents from the phalaveda or astronomy,one should do worship of that day,with solid food and other articles eatable.Phalaveda is the knowledge of astronomer/astrologer in ancient India called Daivagna or Samvatsara(Varsha/Vrishni).Krishi is from Krish (bhoo or earth)and vrish is from seasonal rains and Krishna and Vrishni are related to Agriculture.Paraasara ,the father ofVyaasa ,was a krishi expert,and had established a agricultural system which is very practical and scientific using both little and greater traditions .In Kasyapeeya krishisookthy ,one chapter is devoted to Krishiparaasara and another to the Ereluppaatu (the songs of the people who plough with the ox or eru.Both Tamil and Malayalam words have same meaning for eru.Eranaadu ,Eralpaadu etc of Kerala and Uzhavar of Tamil sangham era are having same meaning).Kasyapasilpa treats Krishisaasthra as the first among all sciences or saasthra.Krishi,Vrikshayurveda and upavanavinodha (the pleasure groves) together are considered in most of these ancient works.These three are the arboriculture and horticulture of the modern times also.

Thus Krishi is economical and practical methods of agriculture,its improvements by various means,animal husbandry,medical knowledge of plants and animals,arbori-horticulture and forms part

of arthasasthra and dharmasaasthra. Since agriculture depends upon seasons and rainfall and ability to predict them meteorologically we find it along with jyothisha texts as varshaphala, varshalakshana, samvatsaraphala etc. Every village had a kaniyaan/jyothsya who observed the signs for one year and brought a vishuphala on Medam 1st, which is the base Naaga year beginning, to predict the monsoon and its effects for the farmer. The state provided his salary by the contributions each farmer made in kind and special gifts from the ruler on special occasions. This was considered as the most important service done for the economical prosperity of the nation and one such meteorological observer existed for each graama as a special officer of the crown. Weather forecasting was their special responsibility so that crops would not be lost and preventive measures can be taken in time. From the veda to Raamayana and Mahabharatha and upto King Asoka in historic period we find great kings and rulers building granaries, roads of transport of products, wells and tanks for drinking water and irrigation, and trees planted everywhere and protection of plants, animals, groves etc based on this economic principle. In the Vaikhanasa Vaishnava rituals agriculture and worship of earth (as consort of Vishnu) and her products as Aiswarya is an important aspect. The plough agriculture (which is associated with the naaga year of Mesha, of South India and Lanka), replaced and co-existed with the older slash and burn cultivation and food-gathering periods, and new crops and new markets and organization of village economy and settlements and trade improved and increased with them. From period of Janaka to Balarama and Krishna this improvement was happening in India and the ancient King Prithu is considered as the first king to organize this activity. The codification of regional wisdom by local people and having a common language for all the people to share this knowledge and protect it was then devised and that is how sanskrit evolved in India. Without a common language of communication, this enormous organization and protection of knowledge was not possible. Hence, several millennia before vedic

period (Sanskrit) the krishisasthra and its various aspects had been here in India. And codification into a common language must be the last, not the first occurrence.

Krishiparaasara verse 6 says “Rice is vitality, rice is vigour, rice is the fulfillment of all ends (of life). God, demon and human all subsist on rice only.” During times of Parasara and Devala all including Brahmana were engaged in agriculture. The sins of killing microscopic and unseen living things by using agricultural instruments were put right by giving $1/6^{\text{th}}$ of produce to the king, $1/20^{\text{th}}$ to the Gods and $1/30$ to a learned Brahmana as the share of social life. The levy and duty to be given was based on the amount of produce and therefore it was not a stress for the people. Krishiparaasara is a collective weather-wisdom of popular vernacular proverbs generated from previous experiences of generations of ancestors. According to Das Gupta origin of such Bengali literature (Old Mithila) goes to a very remote past and that the traditional wisdom of the agricultural people of Malabar is the possible source (Das Gupta 1935, n1, 224-225 q in pp 16 History of Krishisasthra Gyula Wojtilla 2006. Harassovitz verlag)⁸. The prominent Malabar school of astronomy and the provenance of such texts as krishichakranghal, krishisamayanniraya and varshalakshana and portions of krishigeetha seems to prove Das Gupta's hypothesis according to Gyula Wojtilla. It is interesting that in Indike (2.4-5, P.A. Brunt's translation)⁹ Arrian says that “Alone of the Indians they are experts in prophecy, and none save a sophist is allowed to prophecy. They prophesy only about the seasons of the year and any public calamity.”

This statement shows certain important things

1. Till the time of Indike, Indians were the only people who knew the prophecy of the monsoon winds and astronomical significance of it.

2.No one save an expert was given the post of a village or urban astronomer/astrologer .Therefore it was a qualified Government post of metereologist available to each grama/region.

3.They did prophecy only about the seasons of year,the yield of rain,winds and floods and any likely natural calamity .This was for economy ,protection of crops and taking necessary measures well in advance.

Brihathsamhitha of Varahamihira(ch 54)¹⁰gives testimony to this.

Agriculture was not an experimental science by the time of Parasara .The experiments were already done by previous generations,and it had become an applied practical science and astronomy was part of it .The protection of agriculture by structures like sethu,dams,sluices,chaannels were already in practice.Climatology,irrigation,botany,veterinary knowledge ,economic law makes it also an experimental knowledge.

Certain terms in Kasyapeeya krishisookthy :

- 1.Krishikarmavid(one who is an expert in agricultural works)
- 2.Krishikovida(skilled in agriculture)
- 3.Krishipadhathikovida(skilled in the methods/manuals of agriculture)
- 4.Krishivichakshana(experienced/wellversed in agriculture)

These denotes the practical nature of the knowledge and how theory and practice were based on experience and expertise.

Certain excerpts from Krishiparaasara:-

1.Sowing of seeds for transplantation is best in Ashaada.

2.Following Khanaa,it is best to sow paddy seeds within the first five days of the month of Ashaada (May /June).It will yield much crop.This is for Bengal (North eastern states of India from where Parasara gave instructions and is for summer Puncta in Cherrapunchi in Assam and the puncta kols of Chera king of Malabar).Kasyapeeyagnanaknada ,popular in Tirupathi,says Kosala is the best paddyproducing area .In Ramayana (2,100,45)Kosala is an adevamathruka country where

agriculture is based on artificial irrigation assured by sufficient rains.Arthasasthra,Rajatharangini and Bhattothpala have called Kasyapa as an expert in agriculture and metereology.Arthasasthra in this connection mentions Uddalakakasyapa(who had Aruni as his disciple)who had large fields according to puranic lores and the veda.Kasyapa made it possible to cultivate in Kashmere by regulating the rivers.The similarity between the irrigation of ancient Kashmere valley and territory of Pallava kings is not accidental .The patronage of cultivation of paddy by all kings – Chera and Pallava including-as a responsibility of Vaishanava service of

Vaikhanasa is a very ancient tradition.The Mahabharatha (X11.,49,56) says Parasurama gave entire south India to Kasyapa ,after defeating and destroying the kshathriya race and it was he who started to develop agriculture in South India(which later extended probably to west Bengal,Assam,Kashmere valley etc through the south Indian influence as Das Gupta suggested in the case of West Bengal) The region which Kasyapa describes is having assured rainfall to fill up all reservoirs,is clayey red to black soil,and the basic breed is the ongole breed and his terms like sambaka and kalam(rice types) are still used in south India.He has described 120 plant species of which 80 are still seen in Krishna-

Godaveri delta. Even in 100 AD transplantation of paddy as described here was practiced in this area.

Kasyapa says while describing climatology, that when it is hot season in one place, it is cold in another and spring in yet another and the seasons vary according to regions on earth, and this shows that he was well aware of the seasonal changes due to earth's revolutions and the effects produced by it in different latitude/longitude. The meteorological year of India starts with the hot season in all parts, as the first of Mesha. The vishuvath.

The main product of Kasyapa is paddy. His work is divided into the following parts.

- 1. Introduction to the argument for importance of agriculture in both sacred and profane spheres of life.
- 2. Second part description of methods for cultivating grains.

Subdivisions of this :

1. Introduction

2. Division of land

3. construction of water reservoirs

4. construction of canals, wells –establishing irrigation system.

5. characteristics of a good farmer and village officers

6. procuring tools, implements, other resources

7 plough worship (This is seen in the Rgveda also)

8.worship of bullocks (still done in Tamilspeaking countries)

9.Characters of good cows and bullocks

10 season of farming and determining land for rice and pulses

11 procurement of seeds

12.ploughing for sowing seeds

13.cultivating procedure for grain crops

14 cultivation of pulses and other crops.

- 3.The third part includes fruits,,vegetables,upavanavinoda (gardening) and forestry .All is for the economical science and highlights the task of kings in distribution and collection of products and taxes and its organization for benefit of all people.It also contains a few verses about products obtained by mining.

- 4.The fourth part is the rule of edible and unedible things based on Dharmasasthra and vaikhanasasmarthasoothra.

- 5.Offering oblations.A variety of rich cakes and sweets are described including the jilepika.This is the culinary science of kitchen and nutrition ,considered as part of agriculture itself. In this juncture it is noteworthy that Parsurama who gave the Kasyapa and his progeny the entire south India ,taught them the art of agriculture according to Krishigita in Malayalam ,and all the requisites of agriculture are mentioned in this work as it is in Kasyapa's treatise.This work was popular before 17th century in Kerala.It had four Chapters

1 Ch 1. Requisites of agriculture like cowshed, manure pits, ploughs, axes, spades, cattle. Nature of good agriculturists: -respect elders, free from sensuality, abstain from alcoholic drinks, honest and accountable, and therefore paid well. List of operations: proper fencing, manuring, dividing the fields, removing weeds, collecting firewoods, preparing soil, collection of seeds, bestowing water resources

2. Chap 2. Rules of ploughing, transplanting paddy seedlings. Proper day for seeding by astronomical calculation. The enemies of agriculture like weeds and pests enumerated. Proximity to water is a major factor which determines quality of soil.

3. Chap 3. Difference between Kerala and other parts of the country. Pepper and arecanut cultivation best on higher land and paddy best on low lands. Classification of paddy seeds, preparation of paddy fields, treatment of seedlings, fitting of ploughshare in plough, regulation of its position to do effective ploughing and yoking oxen. Cultivation of coconut, jackfruit and palm trees and maintenance of garden lands, flowers and growing chilli. Prescriptions on deep ploughing, hoeing, making pits for trees and instructions on an agricultural calendar.

4. Fourth chapter says ploughing at night is easier than day. Forests should never be destroyed. Auspicious and inauspicious days for agriculture. Defects and virtues of cattle including bulls and buffaloes. Their classification based on tail, spine, horn, hooves, teeth, spots on skin, nose, shoulder, hair etc. This is well ahead of Linnaeus and his morphological classification. Buffalo and ox should not be put under same yoke since they are different in power. Other ancient kings and people related to knowledge of agriculture and animal husbandry are King Nala and Sage Parasurama (G. Wojtilla pp 23)¹¹ Atri, Naarada, and Mareechi (ibid pp 39) Lingapurana (1.5.40) attests Mareechi's role in agriculture. Naarada was the cause for the fluctuation of prices and his text on

this is actually on climatology and called Mayurachithraka (This is referred in Brihadsamhitha of Varahamihira also .Arghakaandakaadhyaaya 4.1 Br Sam).¹².Reference to Krishithanthra of Vridhaparasara is seen in Bhattotpala's commentary to Arthasasthra.It is interesting thatKasyapa,Paraasara and Parasuraama give more importance to paddy and they just mention the others.That means they are more familiar with the lowlying areas where there is paddy fields and are concerned with it more than the other types of crops and that was the staple diet of the regions of south India ,and was produced in Andhra, Karnataka ,Tamil nad and the present Kerala ,and the north east provinces of

Assam.Krishipaarasarya (manuscripts from Orissa)shows a area where there is no irrigation and agriculture is based on natural resources.And paddy alone is cultivated.It speaks of determination of the Lord of the year,determination of cloud,ascertainment of aadhaka of water(measuring the rainfall),knowledge of rainfall in Pausha,,Maagha,Phaalguna,Chaithra,Vaisakha,Jaishta,Aashaada,an d sraavana separately and indication or prophecy of it by such knowledge,the knowledge of rainfall according to revolution of planets(gocharaphala)indication of drought seasons,supervision of agriculture,rule about draught-animals,festival of cows,procession and entrance of cows,lifting of coddung heap,constituents of plough,ceremony of halarasaarana,rule of preservation of seeds,procedure of sowing seeds,application of maayika, transplantation,kattana (padavighattana)of paddy,removal of weeds,release of water in Bhaadra,incantation for the cure of diseases of paddy,preservation of water,taking of a handful of paddy in agrahaayana,planting of medhi in agrahaayana, description of ceremony called pushyayaaathra in Pausa, description of Aadhaka,storing of paddy .This is a very scientific way of teaching all the steps upto weighing and storing the final product in the granary.Before the harvest a minor ceremony of fixing a nala(reed/bamboo)in the field to avert strong winds,to scare away mischievous birds and testing the crop by taking a

handful of sample (sample survey) etc are noteworthy. The final thing is the Lakshmipooja (Goddess of wealth and economy) and consort of Vishnu, in all agricultural operations of India.

The duties of the four varna regarding agriculture were based on their qualifications. The Brahmins had to keep records of all transactions and laws made in regard to them and should be totally unselfish and honest and to have every one's faith in their knowledge, prophecy of seasons, advices and scholarship as well as honesty. They had to pass certain tests of scholarship and unselfishness. Unless they prove this, they were never accepted as the Guru of the entire village for such profecyng, accounting and teaching, advicing, lawgiving duties. The king also have to prove his honesty and dharma and power of protection of crops and animals to get accepted as the protector. The best agriculturist and trader had to prove their merit by improving what they were allocated and making more profits than it yielded before. In this way everyone had to do the dharma of the particular office.

Krishisasthra or krishisamyanniraya, a single manuscript at Chennai Govt Oriental manuscript library is noteworthy, since it is written by one Neelakandan Namboothirippad of Kannur Mana in Ottappalam, Malabar 1926-27. The kol puncha of Palghat district being his territory of agricultural knowledge. Along river Nila, in the graamakshethra of Panniyur, he gives names like naalikera (cocos nucifera) naagalatha (piper betel), pooga (betelnut tree) or areca catechu, Tamboola (piper betel) etc. Both slash and burn and irrigated agriculture are described by him. Apart from the other usual topics he also mentions the yoga for making friends (co-operation of friends) and enemies (reasons for quarrel between them) also which means the co-operative efforts were recognized in kol puncha fields even before any of our developmental programmes have started. And anyone who knows the paddy cultivation on kol puncha fields will also know that it can be done only by co-

operative efforts and by organized skills of an entire population and their lawgivers. Therefore, the relation of Kasyapa, Parasurama, and Pallava dynasties and other ancient agriculturists related to pancha and paddy cultivating areas also speaks of the combined effort of an organized people as well. Keralakrishi, a palmleaf manuscript is an account of agriculture of Malabar, and was taught in Malabar in village schools till independence. It is in old Malayalam. It also describes the meteorological forecasts, astronomical relations etc, the utmost care for the land for cultivation which is fenced, richly manured, ploughed not less than six times. Three kinds of paddy cultivation mentioned in it are

1. Dry seed cultivation
2. Sprouted cultivation
3. Transplanted cultivation

The agricultural year begins on the first of Medam (vishu) in April-May, and the village astrologer (Kaniyaana) fix an auspicious day for turning of the first sod of the season. The harvest of the second crop is in Makara (January-February). Khanaar – bocan, attributed to Khaana (or Kona) daughter of Varahamihira is a Bengali text. It says:- The year in which it rains on the 9th day of the full moon in month of Ashaada, the heron will walk on the very bed of the sea. If it drizzles on that day, it will be followed by heavy rains throughout the year to the extent of making fish inhabit even the top of hills. If it rains now and then, there will be rich harvest, and if the sun sets under a clear cloudless horizon, the crops will not grow at all. (This is the ashaadayoga described by her father Varahamihira in his Varahisamhitha).

A collection of sayings of Daka (who lived in Assam in Lehidandhara village in 9th century according to several authors) is

available in Assamese, Bengali Maithili and Rajasthani languages. The rajasthani tradition say that he was a Brahmin contemporary of king Pareekshith of Mahabharatha and husband of Savithry ,daughter of Dhanwanthari of Kaasi branch. The sayings include :-

1.If it rains in the month of Phalguna,urid is spoilt.If in month of Chaithra,lemons.If in asterism of krithika,the toddy palms,and in that of swathi beans ,sesamum,saith,Daak ,the Gowaala(Gopaala) .”(These are the yogas mentioned in Brihadsamhitha too)

2.If the sky is thickly clouded in the entire month of Poush,but is cloudless in the bright half of chaithra,the grain will sell cheaper than a maund for one roopa(silver).

3.Clouds flying in the morning and cold winds blowing in the evening are sure signs of a famine.

4.If Mrigasira(June)is hot,Rohini(Beginning of June)rains,Ardra (middle of June)gives a few drops,rice will be so plentiful that even dogs will turn up their noses at it.

These type of year round observation of the metereological nature is described and dealt with in 5th century AD by Varahamihira and was continued by astronomers in Kerala upto 15th century and the observations of these scientists were communicated to the villages and the farmers and all people by the village kaniyaan who himself was observing his region for any signs .And this will be communicated in Vishu ,Onam and other important seasonal festivals .Varahamihira also describes summer crops(IX 43) ,autumnal crops(V ,27) and vernal crops (XXV 11 ,I).This corresponds to the puncha,virippu and mundakan of Kerala .Vaikhaanasaagama or Mareechisamhitha or Vimaanaachanaakalpa (procedure of the image cult of temples)

describes the building of temples and the temple cult before 8th century AD and it describes agriculture in detail .The association of temple cult and agriculture is well documented in Indian history.Especially the rights associated with it for the merchant classes is documented well in South Indian epigraphy and in literature survey related to socioeconomic and political changes.

Pairu Madava vivaranamu(Telugu text) of unknown author of antiquity suggests that they knew how to make small openings of channels into the fields(the madava/ mada in Malayalam) for growing crops.Aaruni,disciple of Udhalaka lied down in one of such openings to prevent water entering into his Guru's farm and destroying it during a flood time.(Veda/Upanishadic times)

Viswavallabha in Sanskrit by Chakrapaani (1540-1597) during Maharana Prathapasimha ,gives description of ground water ,its lucky combination in a desert ,surface indication of groundwater in wetlands,ordinary land/mountains,rocks as indicators of ground water.Soil and vegetation also are surface indicators of groundwater.It describes water reservoir construction,examination and suitability of ground for cultivation,soil,propagation ,trees near residence,plantation inside fort,plantations,water management ,protection and care of crops,nourishment ,diseases, treatment ,(related to kapha,vaatha and pitha and their imbalance)indigestion caused by excess water,and food(manure)overmedication, insectrelated diseases,treatment of pruned trees,frost burns,fire burns,lightening,wind,friction,transplantation,trees ruined by animals,contact with unhealthy trees,lapses in modes of treatment,discharge,and contrariety regarding seasons.

It also describes Botanical wonders :-wonders of seeds,of trees,with negative results,of flowers,fruits (seedless fruits)naturally coloured cotton ,improving quality of produce.

In Ramayana we find Prince Bharatha visiting an udyana which grows natural red cotton plant .

Agnipurana in chapter 121 describes the Goshtayathra(festival of cow),krishikarmasamaacharana(Beginning of the agricultural operations),beejaavaapana(sowing the seed),dhaanyacheda (Harvesting),dhaanyapravesha (Bringing in paddy-What we call illam nira,vallam nira ,pathaayam nira),dhaanyanishkramana (Taking out paddy for use)etc which are still done with pomp and ceremony in south India ,and in Kerala..Amarkosa around 6th century AD book 2 ch 9,verses 6-77 gives agricultural

operations ,implements and products.The husking of corn described is exactly like the modern method.The ardha-plough with 4 parts is also described.Ch 42 (section 41)of Arthasasthra seethaadhyakshaprakarana is a comprehensive discussion of supervising procedures like ploughing,sowing,irrigation,storage of grains and involvement of several people on a co-operative basis. The granary of Mohenjo Daro in this context shows the antiquity of agricultural procedures and its scientific knowledge in ancient India.Kalithokai (4th -6th century)and Thirukkural (5-6th century) also contain some references to agriculture.Thiruvalluvar speaks of it in chapter on economy(Artha).Devala ,an ancient rishi ,predecessor to Vrahamihira speaks of ploughing and sowing .Naalatinaanooru(400 quartets)an anthology in Tamil gives it under subheading Porul(wealth/Arthasasthra).Perumpaanaattupadai (100 BC – AD 200)describes a vivid description of village life with basic agricultural operations.Some of the literary sources on prehistoric knowledge of Indian agriculture are :

1.Banerji .S.C.Krishiparasara ¹³.Abook on agriculture .Bengal oriental research institute vol 36.1 &2.1955.1-32

2.Chakravarthy .C.¹⁴Asokavana and itssignificance .Indological journal Vol 3(1965)57-60

3.Choudhary .K.A¹⁵ Archeological plant remains from pre-and protohistoric periods as a source of history of sciences.Indian J of Hisory of sciences vol 4No:1 and 2.(1969)5-10.

4.Mehta .K.L.¹⁶Sesame in India .(1970) From 3600 BC .(Indus valley period) .The remains of Coriza sativam from archeologicval sites of Kaalibanghan,granary in Mohenjo daro,wheat and barley remains from Mohenjo daro,rice and millets from Samkali excavation at Ahar ,knowledge of asoka (sarca indica)and orchards(upavana)forpleasure garden from Ramayana,knowledge of several varieties of plants in Vedas(Aswatha,khadira, soma, palaasa,nyagrodha,pippali,bilwa,udumbara,and apamarga)and the botanical naming of them in Sanskrit for identification,the use of the word Thailika (the oil-pressing)and knowledge of sesame oil from 3600 BC,jujube ,mustard and masura from 1500 BC,mudga (from 1500 BC),antiquity of tree worship seen in the Indus valley seals,are all discussed in these texts.The names of the varieties of rice in Krishigeetha,a Malayalam manuscript gives the following names for the regions of Kerala :-

Thillunaadu(present Mangalapuram/Kannur)

Kolanaadu(Present Calicut and Ernakulam old palghat, Trichur and Calicut as malayaam district)

Edanaadu (Ernakulam , parts of Trichur)

Kuttanadu(Alleppey)

Venad(Thiruvananthapuram)

Paradesam(Kanyakumari,Nagarkovil)

And in this classification Kol /Kolathiri area is the kol puncha area extending from Trichur district and along the Nila mouth upto Palghat .On either side of it were the pallava nadu and the eranaadu,kolathiri nadu ,veliyam and the sangham velar naadu described in the sangham literature .The knowledge of Kurinchi (strobilanthus)and marutham(the kol fields)and naithal(sea shores)

mullai(level lands)and hills and its different characters and plants and animals and huan races were known to Indians from antiquity.Thus the history of Indian races from the foodgathering and wandering tribes to food-producing people extends to prehistoric antiquity and the principles of biology and geography and climate of the region where they lived made this possible by constant observation and experiments and experiences of loss and gain related to certain phenomena which later on evolved to a predictive and applied science .Domestication of plants and animals had happened during the cavedwelling period itself and the oldestcaves are several million years old(Bimbektha etc).The excavation of Harappa,Indusvalley and Mehrgarh has given us enough eveidence for our agricultural knowledge,its use,its trade and commerce with other people(Sumerian,Assyrian, Egyptian, Chinese,and later on with Jews and Greeks and Romans and the British)for a very prolonged period without interruption in basic pattern ,though the political administration changed from time to time,as it does in present day politics too.The history of agriculture survives even today in India and will survive because it is the economic backbone of this country and for our economical and social survival co-operative management of this basic activity is a must .

Vedic Indian agriculture based on hymns of the samhitha portion of Rg¹⁷,Yajur¹⁸,saama ¹⁹and Atharvaveda²⁰:-

1 Types of land :- Land rich with milk and wet with honey and ghee (Rg 1.18.5.5.) The Sindhudesa is rich in horses ,chariots, clothes,gold ornaments wellmade,rich in food,wool,abundant in silama plant(fibreyielding for making ropes to be tied to ploughs) .Rg X 6.7.8 There are tracts in ghats or hillsides,open plains ,stonestrewn lands ,slopes and undulating countrysides ,flat country with green pasture,low countries with great fertility, cultivated lands with homesteads and cows.(Y 227.29 and 245).From these one can select good and bad lands .the surface

features are sandy, clayey soils, stony soil, hilly, and mountain slopes and lands yielding both cultivated crops and wild forest produce (Y 245).

2. Rain and water sources:-

Most of the rishis pray for good water supply. "Send to us for our nourishment and prosperity the quick falling wonderful abundant water in the centre of clouds, effecting of itself much good" (R 1.21.3.10). Armed with thunderbolt, I created all these pellucid

waters flowing for the good of man. (R 1.23.1.8). Floods of land, cleave the cloud, grant us the power of beneficent waters from their abode. (Y 132.6). O, waters, become one with these rice, just as a maiden in season with her man. (Athar 476.29). Prayers against too much rain also is seen. "Parjanya, May the high and low places be made level. Thou hast rained. Now check the rains." (R 6.11.7.10)

3. Irrigation and river water:- Knowledge of dam/bund construction and laying out canals for irrigation was known to vedic sages. Even if their dams /bunds were rough and primitive made of a pile of boulders and brushwood, reeds and wattle (this is the same method used in Punnayurkulam farmers still, every year to build their temporary bunds is significant for its continuity and efficacy) they were effective merely for diverting a portion of the floodwater into canals, considerable technical knowledge and skill and co-operative farming methods should have existed is to be understood. To construct a dam/canal/bund etc more than one skilled craft or industry must be known and several people have to be co-operatively involved for common benefit. Ribhus, the dexterous handed craftsmen rendered the fields fertile, they lead forth the rivers, and plants sprang upon even on wastelands and water spread over two places (R 4.4.1.7). This refers to irrigation and reclamation of wastelands to fertile fields.

May the 7th stream the Saraswathy, the mother of Sindhu, and those rivers that flow copious and fertilizing, bestowing abundance of food and nourishing the people by their waters come at once, together. (R 7.3.3.6). May the agriculturists produce plenty for us, like the floods that flow after the rains, through a thousand channels and like never-failing springs let our grains increase. (R 3.3.7.6). One tribe obstructing a water source and a king restoring its flow for fertility is mentioned. Yajurveda says “Grant us water in torrents, cut the bonds around the waters and set them free. When the floods descend upon earth, parjanya darkens even the bright sky (Y 132.1.2) is also a meteorological Observation. Just as the contents of the treasure house are set free for the yagna, by liberal donors, even so, the rains have been set free from their abode in heaven by Parjanya (Y 132.3). The rivers were channelised to a common receptacle as reservoir of water.” I want to the wide auspicious Vipaasha river to flow together to a common receptacle” (R 3.3.4.4). Indra dry our channels when he slew Ahi, the blocker up of the rivers. (R 3.3.4.6). When he cut Ahi to pieces with his thunderbolt, destroyed the surrounding obstructions (of the water/of rain) whence the water proceed in the direction they desire. (R 3.3.4.7). Rivers corrodors of banks, like armies destructive of their foes (R 4.2.9.7) speaks of soil erosion of banks by flowing rivers. It also speaks of control of erosion by embankments. Maruths, come along, the beautifully ambanked rivers, with unobstructed progress (R 1.8.3.11). Maruths also were concerned with well irrigation. The maruths brought a well for Gothama (R 1.14.1.11). As a thirsty man or ox hastens to a well (R 1.19.4.2) Our praises converge towards you, like herds to a well (R 10.2.9.4). Tie ropes tightly to the waterpots, let us draw water from the unfailing well. Set up cattle troughs, bind straps to it, let us pour out water from the well which is not easily exhausted. (R 10.9.2.5). As the Maruths are always in groups or gana (gana also means a republic or a community on co-operative basis) the vaisya with occupation of agriculture, cattle protection and trade and commerce and economy and happiness and

well being of entire nation was responsible for all such activities .Well built wells with parapets ,and arrangement for taking baths ,and for baling out water for irrigation,is mentioned by tying the fixtures,leather or fibre straps ,etc .Mhote buckets were in use.In North India simple Mhote buckets and in South India more complicated but better technology of Kapiles were used from vedic times according to A.K.Yagnanarayana Iyer ²¹(Director of agriculture and chairman of policy committee of agriculture)in his work

Agriculture and allied arts in Vedic India .Mud wells as holes in the ground ,with no parapet walls also were in use.They were called Kutcha wells and were dangerous to cattle and men Therefore the prayer,"Let not ,Pushan,our cattle perish ,let them not be injured,let them not be hurt by falling into a well"(R 6.5.5.7).Yajurveda Anuvaka 227 says that rivers,lakes ,tanks,ponds ,pools ,stagnant water bodies ,wells ,sea water were water resources and worships the spirits dwelling in all of these water bodies for prosperity of human race.

4.Layout of fields:-

Wide fields ,vast treasures ,spacious pastures,has Indra bestowed on his friends(R 3.3.2.15).Like a field measured by a rod(R 1.1 6. 5.5)shows the knowledge of measurement and finding out the area of the field was known.The standard lengths and geographical measurements were standardized by a kol (used by the architects of yore).The term Kol and Kola(Gola)measurements of the geographers and mapmaking or cartography were known.The boundaries of fields as well as the villages /empires were decided upon by this measures. I erected a safe fence as a protection(Y 13.3)shows such a boundary for a rishi's fields.Yajurveda also speaks of horses breaking through the fences (Y 383.9).Fields abutted on roads which traversed the countryside.The drawbacks of land with fields scattered and under different owners,with no approach roads or pathways for carrying the produce and manure

from and to the fields, except by the sufferance of the neighbour and impossible when there is a crop in the land were well realized. They knew the importance of co-operative large farms under collective ownership and the need for approach roads. "We worship Thee, for the pleasant fields and for the good roads and for the riches." (R 1.15.4.2). We solicit a spacious road for our servants, a spacious road for our cattle, and for our chariots/carts. (R 8.7.9.13). There were roadside rests for carriers of burden. It was a form of public and individual charity. As one carrying a load of bamboos on his head places it on a high load-easing platform and seeks a little relief (Y 354.8) shows their existence. This existed until preindependent days in India and every one constructed such structures, wells, and public tanks etc for common use as charity. A.K. Yagnanarayana Iyer sites an example from Mysore state, under cool shadow trees a group of fixtures erected which comprise of a shoulder high platform of stone over a couple of tall stone slabs. Onto this a man can unburden his load without any one's assistance. Another rectangular overhead water cistern of stone is cleaned and filled with fresh drinking water every morning. The cistern has a small hole at bottom closed by a wooden plug which the traveler can unplug, drink water and then push back the plug and close the hole. A large stone bench also will be there to sit or lie down and take rest. This may seem an old-fashioned charity. Yes. It is as old as the Veda itself. It shows the concern of the public for the wellbeing of all. It is the real good Samaritan's job without expecting any thing in return for the charity provided. My grandmothers used to do this sort of charity at home in Nalapat. At present no one does any nishkaamakarma, for anyone. Even charity work is for getting something in return. We are losing our values and becoming more and more selfish and individualistic. (like tax evasion, fame etc). Rgveda says about a good field in the hands of a bad cultivator is a bad field. (Like a pleasant field given to a beggar. R 10.3.4.6). That is the modern socialistic concept that a field should be possessed only by one who can put it to full and proper use. So, the Rgvedic people

were most ancient but were more modern in their socialistic outlook than any of the modern intellectuals. A barren field is compared to a bald head. "O, Indra, These three places do thou cause them to grow. My father's bald head, his barren field, and my body. This field which is my father's, and this my body, and the head of my father do Thou make them bear a crop." (R 8.9.11. 6.5). Atharvaveda say "To grow hair, Jamadagni (father of Parasurama) has brought this herb. May it grow hair on your head, thick and straight like the reeds. (Ath 310). The herbal medicinal knowledge is thus attributed to Jamadagni, the father of the founder of Kerala. Apala, daughter of Athri restored the resplendent beauty by Indra, by passing her through his chariot, the chariot wheels, a hole in the yoke of his chariot and this ritual is enacted in the marriage ritual of Brahmins. The yoke is placed over the head of the bride, resting on a ring of Darbha grass, with utterings of manthra as a fertility and rejuvenation rite. The fertile field or Kshethra, a fertile woman and a hairy head are equated with the earth bearing oushadi and vanaspathy for sustenance of the species and races.

5.Seasons:-

Crops and seasons and their knowledge go together. Only highly skilled agriculturalists can relate the two and for this prolonged, even millennia of experience is needed for generations of people. Therefore, what the vedic rishi says about the seasons and crops is to be cognized by the fact that he was very well aware of the monsoon winds, rains, geographical peculiarities of India and its products and agricultural practices for a long period. And it cannot be imported from any other geographical area, and the view that vedic Aryans came to India from somewhere else is not a feasible argument. They were skilled in agricultural knowledge and meteorological factors of the subcontinent by prolonged experience. The days of the year fell into 94 divisions and the growth of crops noticed presumably through different sections of the period. Vishnu

causes by his gyration the 94 periodical revolutions (R 1.21.16.6) and it is this division of the year which is connected to seasons and crop production. Wilson has interpreted this as 1 yr, 2, solstices, 5 seasons, 12 months, 24 paksha, 30 days, 8 prahara, and 12 raasi altogether making 94. But from Varahamihira's panchasidhanthika and his Brihdsdvarahi samhitha gives another plausible explanation is related to the ayanamsa. The degrees in a circle is 360 days but the days in a Paithamaha panchavarsheeya yuga is 366 /per year. There is 6 days difference between the two. If we divide these with 94 which is the periodical revolutions decided upon by Vishnu's gyrations, we get 180 and 183 with a difference of 3 days. Varahamihira takes this and says that during Paithamaha sidhantha the ayana were in Aslesha and Dhanishta (Dakshinayana and utharayana) but during his time it is taken at the beginning of Karka (cancer) as Punarvasu and at beginning of Makara as Uthrada star. The difference between aslesha and punarvasu is 3 days and between uthrada and dhanishta also is 3 stars. Thus a + - of 3 days for ayana difference is to be accounted for. Not more than that. This is the law of gyration spoken of in the Veda. The natural is in Aslesha and Dhanishta (prakrithy) and the artificial is in punarvasu-uthrashada (vikrithy) according to Varahamihira. That is during olden days 120 and during his times 90 days is taken for calculation. (90 X 4 = 360, & 120 X 3 = 360 +/- 3 being common to both)

Punarvasu	80 to 93 .20 degree
Pousham	93.20 to 106.40 degree
Aslesham	106.40 to 120 degree

He says from Makara to the northern direction, and then from Mesha onwards the southwest direction starts and is good and fertile for all plants and trees. The winds are in the southwest direction at that period. The southern course from Karkitaka, after Thulaam is the time of northeastern winds and direction. Since these are still experienced in the same way, the vedic rishi was

aware of the seasons and the monsoon winds. May the grains ripen through nights and days, and paksha of 15 days, months of 30 days and the year comprising the seasons in their regular order and bring happiness (Y 366). The role of soma/moon is expressed as the exhilarating effused juice, the fifteenfold soma (R 10.2.11.2) and soma plant grew in 15 days of the bright half and wilted in the dark half. Vasantha is delightful and fit for enjoyment. Greeshma is abode of joy. Varsha, sarath and sisira are charming and give intense pleasure. (Saama kanda 63. Hy 2). Knowledge of lunisolar calendar and the intercalary month was known. Rgveda says “He, Varuna knows the 12 months and their productions and that which is supplementary engendered (R 1.6.2.7). Varuna being the lord of the sea, and of water bodies, it also denotes the adjustment of trade and commerce and agriculture and the avocation of life to peculiarities of different parts of the year. Comparison of saka and Malayalam months named after the stars and star clusters of the zodiac respectively and the conjunction of them with seasons of India.

Pousha	Makara	Sisira	Winter solstice utharaayanam
Maagha	Kumbha		
Phalguna	Meena	Vasanth	
Chaitra	Mesha		Vernal equinox vishuvam
Vaisakha	Rishabha	Greeshma	
Jyeshtha	Mithuna		
Ashada	Karkataka	Varsha	Dakshinayana Summer solstice
Sravana	Simha		
Bhadrapada	Kanya	Sarath	
Aswina	Thulaa		Vishuvam Autumnal

			equinox
Karthika	Vrischika	Hemanta	
Margasira	Dhanu		

The Indian monsoon rain and the varsha season :-

Rain was a source of genuine enjoyment for people. Rain meant food for all in the coming seasons. Sustenance of animals, birds and man by ample annam (food). Parjanya, the rain God brings food. Frogs bring and harbingers the coming of rainy season. They awaken as if musicians in a concert season. "When the waters of the sky fall upon them they, sleeping in the lake like a dry waterskin, rise together, and their croaking is like bellowing of cows when joined by their calves (R 7.6.14.2). The parjanya has sent rain upon them, thirsty and longing, then one frog meets another, croaking his congratulations as a child calls to its father with inarticulate ejaculations. (R 7.6.14.3). One of these congratulates the other, as they are both delighting in the forthcoming rain. The speckled frog leaping up repeatedly when moistened by the shower, join greetings with the green one (R 4). One has bellowing of a cow, another the bleating of a goat, one of them speckled and another green designated by a common appellation. They are various coloured and croaking, show themselves in numerous places (ibid 6). Like Brahmins at the soma libations, at the Athirathra sacrifice, you are now croaking around the replenished lake throughout night for on that day of the year, you frogs are everywhere about when it is the setting in of the rain (ibid 7). May the cow-toned, speckled, green and other ones grant us riches (ibid 10).

6. Ploughs and ploughing:-

There are three hymns addressed to the kshethrapathy (ruler of the kshethra/or the field/land). With the master of the field, our

friend,we triumph .May he bestow upon us cattle ,horses,
nourishment,for by such gifts he makes us happy.Lord of the
field,bestow upon us sweet abundant water,as milchcow yields
milk,droping like honey ,bland as butter.May lords of water make
us happy .

May the herbs of fields be sweet for us ,may the heaven's waters
,the firmament,be kind to us.May the lord of the field be gracious
to us.Let us ,undeterred by foes ,have recourse to him.

Hymns addressed to shuna and shunashira are three in number
(.Shuna is dogstar as well as the God of ceremony of ploughing).

May my oxen draw happily.The men labour with happiness.The
plough furrow happily.May the truce bind happily and wield the
goad happily.Shuna and shira be pleased by our praise.And
consequently sprinkle the earth with the water you have created in
the heavens.

May the ploughshares break up our land happily.May the plough
go happily with the oxen.May parjanya water the earth with sweet
showers happily.Grant shuna and shira,prosperity to us (R 4
.5.12.1-8)

Chandogya Upanishad speaks of Bakadalbya²² observing the
binary star of the dogstar Sunaka for foretelling rains and in India
this was a very important event right from vedic (Sirius) times
because it also foretells the monsoon and the trade searoutes
depended on it.There is a hymn to sita(the plough channel) as
well.Auspicious Sita,be present,we glorify thee.That thou mayst be
propitious to us.That thou mayst yield us abundant food.May
Indra take hold of Sita.May pushan guide her.May she ,wellstored
with water ,yield it as milk year after year.These rgvedic hymns
show how the agriculture and its rites yielded food year after year
and made the country selfsufficient in food .

Even now we have a ploughing ceremony before each season of agriculture. In Mysore it is called Honneru (ponneru) or the golden plough/golden oxen. This word is pregnant with meaning of wealth and of Sri, the consort of Vishnu as golden (suvarna) Sita. The day and hour is fixed by the village astrologer. The headman goes to the field, holds the plough, ploughs a few furrows, villagers in a prayerful mood, pooja and prayers offered begin the general ploughing after this. This was what was done by Janaka in Mithila when he got Sita, from the Sita. And in Mahabharata it was Balarama who was the expert ploughman. (Kari and kalappa are names for plough in Malayalam.)

The vedic plough was an implement fashioned with the eye of artistic taste and beauty. The owners were proud of it. It had ornamental handles. In old agricultural families it is worshipped as the weapon of riches and pride. The plough handle, the seed drill handle, the seed bowl, the sickle handles, parts of carts, cattle mangers, carved to resemble limb or head of animals – leg of lion, face of sheep, bull, man, parrot just with floral designs were used. Though the plough handle was ornamental, the business end was serviceable and thus it served a double purpose. Yajurveda (18.13-20) describes the entire process of ploughing as well as the co-operative team spirit of the people in the operation of ploughing large fields. It follows like this: – “Our auspicious boughs with ornamental handles, and sharp pointed shares, cleave the ground to the happiness of the cows, sheep and the wellgrown maidens. Ploughmen plough round and round, plough burrows become closer and closer, concentrically and of good depth. They work in teams with delight in heart for good ploughing. May the ploughshare plough round and round, happy with the prospect of heavy crops, May the rain God grant us plenty of milk and honey. Fit up the ploughs, yoke them close to each other. May Indra press the plough deep into the soil. May the sharp pointed share cleave the soil and push the ploughed earth on both sides of the furrows.”

The plough must be having the same shape and type as the plough used in Indian villages today, with a V-shaped bottom that push the soil on both sides of the furrow .”As the husbandman ploughs the earth repeatedly for barley “(R 1.5.6.15) is a simile used by the veda. This shows the effort needed for ploughing. But the effort was forgotten by the expectation of a crop and the songs associated with the team work. This is called Erupaattu in Era(u)naadu eru being the pair of oxen for ploughing. Punnayurkulam and south Malabar were part of Erunaadu, the land of oxen, and the ploughmen or agriculturists from time immemorial.

The erupaattu and good animal husbandry and goraksha went together in vedic India as proven by the Rgvedic hymn:-“Plough bullocks to be treated gently ,not to be goaded or hurt,coaxed by good words and bucolic music.Wield the goad happily as a ploughman repeatedly drawing his furrows praising and addressing his oxen(R 8 .3.8.19).Now,we find people lashing and using sharp pointed goads to hurt animals and using vulgar abusing language in racy vernacular which is gainst animal psychology.It is in fact against human psychology as well.Using such methods of hurt and abuse no one can make good work or get happiness either from animals or from human beings is a fact.“O.bulls,who are strong to pull with the yoke on your shoulder”(Y 22.7)shows the strength needed for the oxen to do the job.For success all the oxen,humans and instruments had to be strong .”May the plough bullocks,may the ploughmen,may the plough ropes be all victorious ,may the whip be lifted victoriously (Athar 88.6).Were horses used in vedic India for ploughing? For black cotton soil in hot weather which required heavy ploughs which can be pulled by 3 to 4 pairs of bullocks it was better to use a horse to plough .So the horsepower as unit was used in such black cotton soil.Rgveda says:- Set up the cattle troughs,bind the straps to it,let us bale out water from the well which is not easily exhausted,satisfy the

horses,accomplish the good work of ploughing”(R X .9.2.3, 5, 7).Horses were used for riding,for chariots and carts and as warhorse also.For ploughing it was used rarely ,only in special cases when it was black cotton soil and the weather was too hot.These factors show agriculture was of a very high standard and done with scientific knowledge of what they were doing,and not mechanically as transferred knowledge from somewhere else.Lot of thinking and experience of geographic and soil conditions had given this scientific outlook and methods of agricultural development.”Indra,I ask your help in ploughing for increase of grain”(Y 16.10).May the lowlying lands so ploughed and rich with milk and wet with honey and ghee come back to us much fertilized.(Y 189.20).From this I wonder whether the yajurvedic rishi has experienced the loss of the low lying wetlands (by floods and by sea)and was praying for its reclamation !Was it such reclamation the vedic sage Parasurama did with his axe which could make a plough from wood ?”The ploughshare furrowing the field provides food for the ploughman(R X 10.5.7) and giving annam for an entire population by reclamation of fertile wetlands is indeed a great deed.

7.Seeds and sowing.

The barley (millets)has to be sown in fields properly prepared by the plough(R 1.17.2.21).May the seeds be viable.May the rains be plentiful.May the grains ripen through nights and day,paksha of 15 days,30 days,and the year comprising seasons in regular order of succession(Y 366).Sow the seeds.May the earheads be many and heavy for the sickles to cut and pile in heaps.May these auspicious ploughs bring us wealth in cows,sheep,chariots,wellnourished and strong women.(Ath 88.1.7).Harness the ploughs ,fit on the yokes, now that the womb of earth is ready to sow the seeds therein.Our praise to Indra,May there be abundant food,May grains fall ripe towards the sickle.(R X.9.2.3)

We can find the synthesis of the strength of faith in the divine help and prayer, with the confidence of scientific knowledge of every step in agricultural science and willpower to do karma or action for a better future and for sustenance of the races of each and every creation in vedic hymns.

8. Rotation of crops.

As the growers of barley often cut the barley, separating it in due order, (R X 11.3.2) says the rishi. About this Webster makes a comment that the rishi knew rotation of crops or succession of crops which is an important advancement in knowledge of agriculture.

9. What were the crops cultivated by vedic Indian?

Barley, wheat, rice and other grains, pulses and fruits and vegetables of different varieties, sugarcane, gingelli and grapes are mentioned in the veda. Clothing, weaving of garments are mentioned indicating they grew cotton. Various steps in sowing, harvesting, winnowing, storing and preparation and processing are mentioned for the grains. (R 1.5.6.15; 1.17.2.21, Y 109.2. Y 122.1 mention barley).

The barley grain heaps grow and the stores increase. Oh, Barley grains, increase even more, inexhaustible as the sea (Ath 315. 152). Winnowing speech as men winnow barley with a sieve (R X 6.3.2) is a simile which I have heard in my infancy. My great grand uncle used to say, one should not put saraswathy (vaak) in the winds without control. The sieve to winnow grains and speech is to control by viveka what is good and bad. Assembled cattle feed on barley (R X 2.11.8). We have prepared the parched grain and curds for Thee, fried barley for Thee, also cakes and butter (R 3.4.14.7). Grains of parched barley steeped in ghee (R 1.4.5.2) vegetable cakes of fried meals, do Thou be substantial, wholesome and invigorating and body, do Thou grow fat with boiled milk and

boiled barley (R 1.24 .8.8.and 9)indicate not only the food habits but also the scientific knowledge about nutritional requirements for healthy body and growth of nervous system for cognition,learning and wisdom.

I seek barley and rice grain.Do you eat barley and rice ?You are swallowing the grains as if a python is swallowing the sheep.

(Athar 313.2)says a rishi to his companion who is probably too gluttonous.

Praana and apaana are rice and barley.Praana in barley and apaana in rice(Athar 467.13).One supply the deficiency of the other.They have to be supplemented with each other.

May we escape poverty by means of cattle and escape hunger by means of barley(R X.4.2.10)Cattle was for sale and for money as barter system prevailed and was sign of one's wealth and barley was for food especially in areas which lack monsoon rains and in times of famines to prevent hunger and it was also used for cattle food.

Yajurveda mentions several grains and pulses (Y 244) and it mentions wheat also.The hymn is as follows:-“Through yagna may I secure happiness,riches,love,affection,diligence in ploughing, success against all enemies,food,milk,truth,agriculture,rain, gold,wealth,rice,barley,blackgrams,greengrams,wheat,thuvergram, Bengal gram,navara grains,shamai(chaama)sirumani rice,and orchard crops.”

O,Agni,who consumest the flesh,the black goat is your share,lead is said to be your wealth,and ground blackgram is your offering. (Athar 475.53).These are articles used by ancestral worshippers.

Both the blackseeded and white seeded varieties of gingilly were grown for oil.The seeds were pressed for oil and the one who does this was known as Thailika.It was used for lighting lamps,for anointing body and for cooking.

Taste ghee and oil of the gingili(Atha 8.2).I offer dried sugarcane, white gingili, reeds and bamboos(Athar 475.53.54)These are articles used by Indra as fuel..Sugarcane was crushed to make gur.Jaggery was made from sugarcane.The dried sugarcane or refuse (bargasse) or the refuse of the crushed sugarcane is still used as fuel in India.Sugarcane is sometimes a metaphor for love and affection with which one binds another.The madhura or sweet taste is the reason for this metaphor.I have tied you round with the sugarcane stems in order to avoid dislike (Atha 34).Sugarcane is the weapon for kaamadeva and for the devi alike.

Fruits, flowers, vegetables and roots and medicinal herbs were also cultivated."O.plants, who yield flowers, fruits, edible roots, gladden him with your produce"(Y 177.12).Rudra, nourished by vegetables, bestowed by Thee, May I live a 100 winters(R 2.4.1.20 is a prayer for longevity, which is a sign of reduced mortality rate and health of community.May the waters, crops, plants, creepers, favour us.(Y 87.4).Give us medicinal herbs for cows, horses, men, sheep and goats (Y 112.1)shows the people were concerned not only with human health but also health of the domestic animals and veterinary medicine was known too.the hymn"May I be liberated from death like an Urvaaruka from its stalk"(Mritunjaya manthra R 6.4.5.12)show the awareness of cucumber, bottlegourd and other types of gourds too which were used for food as well as for musical and surgical instruments.Atharvaveda in a humorous tone says"He is like an empty bottlegourd"(Ath 720,1.4)meaning he is devoid of substance of brain in his skull.

The method of pruning grapes and fermenting art to make juice of wine was practiced in vedic India.Rgveda says:"Cut off the foe like an old pruner cuts off the protruding branches of the creepers"(R 8.5.10.6).Potations of soma contained in Thy interior, for exhilaration, like the ebriety caused by the wine (R 8.1.2.12)shows they knew the action of wine as well as the action of certain medicines used for anaesthetics.North west India, especially

Punjab was the center of cultivation of grapes for 4000 years according to De Condelle. Wilson translates *sura* as wine .

Though cotton is not mentioned in Rgveda strands of thread, warp, woof, weaving etc are mentioned. A.N. Gulati (Microscopist Technological lab Bombay .Indian farming .March 1949)²³ observes that “According to Marshall cotton and woolen clothes were used by preAryan inhabitants of Indus valley over 5000 years ago”. Gulati and Turner (J of textile institute Manchester)²⁴ analysed a piece of cotton cloth sticking to a silver vase excavated from MohenjaDaro and found it to be cotton similar to a coarse type used even today in India. Mackay (Indian civilization pp 138)²⁵ is of opinion that the numerous spindles and spindle whorls found at Mohenjo Daro ,although indicative of spinning as a domestic occupation, were to spin cotton. The majority were too small and light to spin an elastic fibre like wool.

The scholars found a controversy in the fact that Rgveda does not mention cotton cultivation while Mohenja Daro shows cotton spinning. They give Rgveda a timespan after the IVC and therefore has to find out a reason for this discrepancy and therefore they say, during IVC it was present and by some reason the plant became extinct by the time the Rgveda was written and then it resurfaced again. But this is illogical thinking just to accommodate the view that Rgveda is after IVC .Rgvedic rishi knew both wool and cotton spinning .But it is possible that the cotton was a wild grown variety and not cultivated by human beings during that period. Therefore though spinning is described, cotton as a cultivated plant is not mentioned. This is my view and appears to be more logical explanation of why cotton is not mentioned as cultivated plant in Rgveda. Then there is no need to interpose an interim period between IVC and Rgveda and it also means that Rgveda was known even during IVC or before that .The predetermined date of Rgveda that it is after IVC and after a imagined Aryan invasion, is the problem of controversy between

scholars and it is an artificial construct only. May they guard the strands in the warp from breaking ,says yajurveda(Y 383.4).He Is the warp and the woof (Y.398.8).The 34 strands of threads required for the yagna have been woven.I tie up the ends of the threads which have been broken in the weaving(Y 375.1) .In marriage ceremonies the bride discarding the premarital garments which become the prerequisites of the officiating Brahman .Rgveda asks”Put away that garment soiled by the body”(R X.7.1.29).This garment is inflaming.It is pungeant.It is like stale soma.It is like poison.The Brahmin who knows the surya,verily desires only the bridal garment(R X 7.1.34)This is the wedding of the devotee bride to the athman the sun and the discarding of body for the Athman.

Behold the forms of Surya,the ashasana,the vishasana,and the adhivikarthana .Of these the Brahmin relieves her.(R X 7.1.35) The bridal trousseau of three different types of clothes are mentioned here.The ashasana is the border cloth and vishasana is the headcloth or veil.This is the clothes covering the upper part of the body and the head.They are ornamental and woven with embroidery by the mothers and grandmothers before their daughters/granddaughters attain puberty.The border design of this is mentioned here.Adhivikarthana is the cloth covering the lower part of body .It is a stitched and a tailored garment ,a type of underskirt of the bride.So,Rgvedic women as brides wore such clothes and removed them during ceremony of marriage for fertility rites to happen.

Rgveda (X 6.7.8)mentioned silama for tieing ploughs .It is Abroma angusta in modern terminology.Ropes of different types were used to tie carts,mangers,cattle,in wells,in nets of fishermen and by hunters and agriculturists and both cultivated and wild fibres of vegetable type were used.About lotus fibres Rgveda says”She breaks down the precipices of the mountains ,like a digger for the

lotus fibres”(R 6.5.12.2).This fibre has to be carefully reeled and is used for sacred purposes.

10.Harvesting of crops:-

Harvesting begins with a prayer.A regular festival is there in the local temple,where the first sheaves cut are brought and examined by the expert and the nature of harvest determined and this first rice (in Malayalam Puthari nivedyam as in Guruvayur temple to this day)is offered to the local deity amidst much reverential rejoicing and accompaniment of temple music.The harvesting tool is the sickle.This is the sole method in rural India to this day for harvesting.”I take sickle in my hand with a prayer to Thee”(R 8.8.9.10).

When Indian National congress was formed the symbol selected was a farmer with plough ,and a pair of oxen.And when Indian communist Party was formed it was a sickle with a sheave of paddy,both being the symbols and tools of agricultural vedic India.It is interesting to note that when congress split several times,the present symbol of hand was selected by Indira Gandhi and when CPI split,the CPI(M) selected instead of sheaf of Crop,a hammer retaining the symbol of sickle.The hand power and ths sickle power (but without ploughing,good harvest or oxen)and hammer of the artisan has replaced the priority concept of India.

“May crops swell at my prayers.Let the sickles cut down the heavy crops of grain”(R 6.12.9.10).May there be abundant food,may the grain fall ripe towards the sickle(R 10.9.2.3).There were two types of harvesting.Cutting the crop at level of ground and separating only the earheads (headling)as in irrigated raggi,jowar,even wheat and barley in some places.

“As barley is harvested by separating the earheads from the stalk”(Y 122.1).Thou milkest the nutritious grain from the humid

stalk(R 2.2.2.6).Cutting down crops to encourage tillering was known.”May you tiller a hundredfold by my cutting”(Y 2.6). The inferences are:- The fodder grass grown from which many cuts are usually taken ,more tillering taking place after each cut;The practice of ratooning was known ,That is,taking a second crop from a stubble growth of first without sowing or planting afresh.;That plentiful aftermath of stubble growth from harvested field of rice or barley was sought after ,for grazing of cattle;And practicing coppicing tree growth as in fuel trees inducing many stems from the cut end was known.Pruning of forest trees was done annually and proper care to their cultivation and preservation given.The reference in the rgveda already mentioned(8.5.10.6) used the word old pruner,because pruning requires much experience for the gardener and gardening /and forest care was entrusted to experienced old people .

11.Storage:-

Much cleaning was done before storing the grains.Winnowing the grain was already mentioned for cleaning the unnecessary fine particles(Y 354.8).Grain put through a sieve and then winnowed in wind is free from chaff and light grains.The great granary in Mohenjodaro bear testimony to the vedic storage ceremony .The prayer when the grain is filled into the granary was :-“May the grain heaps grow and the stores increase”.(Y 109.2).The cleaned grain heaped in the threshing floor and villagers worshipping it is still seen in villages of India.When the Upanishads say “Annam or food is God and worship it as Athman “it was not just theory but a practice every one meticulously followed .The grain after proper prayers and pooja/worship is carted and taken to the grain store either in temple or house .The children and people in Kerala during this time say”Illam nira,vallam nira,pathaayam nira,unnide vayaru nira”(May the houses,the baskets,the granaries and the stomachs of children be filled with grains/food) and I remember my little brother doing worship and bringing the first grain home and all of

us chanting this prayer together .Now there is no such rituals,nor is there agriculture or granaries to be filled.Everything has been lost at least in some villages of India but persists in others and in local temples as relic of a bygone lifestyle.If this is religion ,what is the lifestyle of a people ? The lifestyle of Indians itself is their spirituality and their religion and misunderstanding this great tradition is the new generation theoretical historians' greatest mistake.

12.Pests and diseases:-

Field pests and storehouse pests were familiar and were dreaded enemies of the farmer.The visible enemies like beetles,bugs , caterpillars,insects and invisible enemies like fungi and bacteria caused diseases to grains or destroyed them .In the stores the rats,and moths and sparrows in the fields were also enemies for the farmer.“Worms,insects and other pests ,seen and unseen,of many kinds and many names ,male and female ,leaders and followers,I destroy you root and branch “(Athar 165).

‘O,Aswins,destroy the rats and bandicoots that burrow into our granaries.They may eat up all our barley.Save our grains.Destroy the borers,beasts ,locusts,which damage the grains in the earheads and prevent them from ripening.”(Ath 223).Atharvaveda uses an incantation to kill all worms as follows:”Grind down worms as a physician grinds his medicinal mixtures in a mortar.I destroy those worms which are visible to the eye and which are not visible,in the body,in the head,in the blood vessels,and those which bore and those in the jungle,in the herbs,in the cows,in waters and and in my body”(Athar 66).The presence of disease causing organisms seen and unseen and the concept of their ubiquitous nature and methods of their destruction as part of medicinal knowledge is here indicated.

In page 26 of his book A.K.Yagnanarayana Aiyer gives two incidences from his childhood.His grandmother used to heal

diseases with mantra ,vibhoothi application etc.And he says her mantras in local language were almost similar to the mantra in Atharvaveda.Once he had a Government sponsored insect pest control programme and the manager who did everything he had learned in the university failed to control the pests.Then a local person recited a mantra over the crop.The pest disappeared to the manager's astonishment.He reported this in his data.But its publication aroused skeptical remarks ,not unmingled with pity for the poor manager's credulity and scientific knowledge.

13.Food consumption:-

Grain was boiled whole and converted to a whole meal.It was made to cakes like chapaathi,poori,paratha,dosai,iddli,vadai and the like and this was a little different in upper and lower India as it is today.The food was dripping with ghee which was abundant so that people got nutritious food.Rice was parched grain and the puffed article .The puffed rice was handed over to the bride by the brother to be offered to the fire.This custom persists from vedic times to date.Pulses ,oilseeds and grains and the different articles and spices of medicinal value formed the culinary art of a variety of dishes and both men and women were proficient in this.In Mahabharatha we find King Nala of Naishadha and Bheemasena as experts in this art.Vegetables,edible roots,butter ,milk,curds ,ghee,and honey are mentioned as diets of the vedic Indians. Throw corn on the grinding stones(R 11.7.93).Vegetable cake of fried meal,do thou be substantial wholesome invigorating and the body may then grow fat on boiled milk and boiled barley(R 1.24. 8.9.10).The grain was powdered before cooking in a grinder from the above reference.Grains of parched barley steeped in ghee is mentioned in rgveda(R 1.4.5.2).We have prepared parched grain and curds for Thee and fried barley for Thee ,also cakes and butter.(R 3.4,14.7).Nourished by vegetables which are bestowed by Thee ,may I live a hundred winters (R 2.4.1.2).O,plants,who yield

flowers ,fruits,edible roots to gladden Him with your produce(Y 177 .12)is a hymn in Yajurveda.

All these show the prominence of agriculture and a predominantly vegetarian diet.But did the people eat flesh as well? The hunting and wandering tribes did eat flesh of the hunted animals for certain.It was mainly small game.The kings also ate meat due to their hunting habits.The kings or kshathriya belonging to the mountainous and forest tribes were more of this habit than the Brahmakshathra kings who remained vegetarians .The Kerala kings were of these two categories.The predominant population was vegetarians .The Brahmins,the brahmakshathra and the vaisya remained vegetarians .The others ate meat on special days, occasions,and on sacrificial days(R 1.22.6.12; Sathapatha 3.1.2.21) and on the arrival of a guest who wants a nonvegetarian meal. (Grihyasoothra .A.Jacobi .Encyclopedia of religions and ethics)²⁶. The answers and interpretations vary according to preference and context of interpretor as shown by the interpretation of Rgveda (1.22.6.12) by sayana and Maheedhara as the eager devas are clamouring for the remains of the sacrificial animal to be offered to them in fire,and Wilson interprets as the mortam men desirous of flesh are clamouring for the remains after divine offering(pp 262.vol 1 Wilsons translatory note on the hymn).The matter is one of predilection.The vegetarian sayana and Maheedhara knowing the Indian tradition more,and the nonvegetarian and less familiar European Wilson from his own knowledge of taste of flesh has their independent interpretations.The mountain and forest people were regular nonvegetarians who survived on small game and forest produce.Thus three categories existed .Pure vegetarians, occasional meat eating and regularly eating small game flesh. In sacrificial offerings the remains of the animals were offered to agni by priests.Part of it was disposed of by the meat eating population.

According to Sri Nateshasasthri (Tamil translation of Manthraprasna .Kadalanghadi Natesasasthri pp 185.,307.10.)²⁷the

rule was to offer the most priced article to the guest and in agrarian India cattle being the most priced article it was given to the guest. The vegetarian guest would have taken it home and protected while the nonvegetarian nonagricultural professional guest would have preferred it as a meal and the host might have been by rule of athithipooja, sacrificing his most coveted and desired possession as a nishkaamakarma. In veda the horse is a symbol of universe and cow is the symbol of world and sacrifice of it for others was a nishkaamakarma. (Preface to yajurveda. Tamil translation. Ashiriyar M.R. Jambunathan pp12)²⁸. Before Bhaagavatha period during Vaajapeya sacrifice 20 or more cows were sacrificed (Life of Appayyadeekshithar published in marghabandhu vol 14.No:9. pp22-24)²⁹ and after Bhagavatha period the sacrifice of animals was completely prohibited. Bhaagavatha period happened before BC 3100, when Vyaasa lived. Hence, the vedic hymns with reference to animal sacrifices were before that.

14. Status of agriculture and agriculturist:-

High praise is given to both agriculture and agriculturists. It is the whole foundation of life on earth, and of happiness and health and wealth. The pursuit of it as a profession was greatly honoured and enjoyed. May your wealth be nourished by agriculture (Y 118.1) shows that it was the backbone of Indian economy and still is whether we recognize it or not. Play not with dice, pursue agriculture, delight in the wealth so acquired. You gambler, remember there are cows and there is a wife (to look after and care for) says Rgveda (R 10.3.5.13). Rgveda (6.6.4.2) speaks of Lords of wealth of corn indicating the economy was agrarian. Grant us a son, who is the owner of cultivated lands, the possessor of thousands (R 6.2.5.1) wide fields, vast treasures, spacious pastures has Indra bestowed upon his friends (R 3.3.2.15).

The tiller of the land/Uzhava in Tamil had a special status in society. Janaka, the learned king of Mithila was a tiller. They are

neither Brahmins,nor do they offer libations,and are devoid of wisdom and has speech that is prakrithic and uncultured ,yet they becoming the ploughmen and pursuing agriculture(R 10.6.3.9)attained great status.This is a modern attitude a white collar job university postgraduate has about the illiterate farmers even today,but we must remember that the ryot was and is the pivot of society when food has to be produced and when there is dire needs of famine and after that they are forgotten as soon as plenty prevails.The white collar professional think that the farmer is only one step ahead of the bullock behind which he walks and the only difference between them is that one talks and the does not.But when the whitecollar professional needs food ,he has to get the grain produced by that same tiller /agriculturist.This was known by the vedic scholar and not by the modern scholar is the only difference we can find between them.The sangham literature is abundant with high praise for the uzhava and for the Chera kings who produce grains in abundance so that he could feed both the sides of the Mahabharatha war(18 akshouhini of army)free of cost for 18 days .

15.Flora and fauna of vedic times.

Most of the vedic flora arenot identified yet or given the latinised nomenclature.Here some of the named ones only are mentioned.

Soma-sarcostemma acidum and Asclepias acida

Madhu vanaspathi liquorice root (Athar 34 1)

.

Vibheethaka Terminalia bellerica used as dice.

Khayer Mimosa catechu used as wood for bolt of axle of cart(R 3.4.15,19)

Sishu –Dalbergia sissoo is wood for floor of carts

Shami Acacia suma one of the pair of firestick Arani to produce fire

.

Aswatha Ficus religiosa

Salmali against snake poison possibly Hippamone Marcella used for poisoning arrow tips

Reeds and sedges for weaving mats cyperus pangorei ,bamboo,and palms

Grasses like kusa,shara,dharbha,shairya,veerana

Lotus- padma

Shyaami which restore a diseased person to normal state

Sirakhthian which is a fungicide for white stem disease of plants

Prisniparni for impoverished blood ,weakening,death of foetus,abortions etc

Rohini for broken bone

sapamarka for hunger ,thirst,loss of vigour

Arundhathi for increasing milk flow of cows

Vishanaagai to cure diseases

Paithvam against snakebite

Aswathy and somavathy and udojasi for cure of diseases

Palasa *Butea frondosa*

Vrishyam or veerya for virility

Apaskambham and shrishti antedote against all poisons

Vaaranaavathi also a similar antedote to poisons

Uthaanaparna is a love potion used by women to win undivided love of her husband/lover

free from rival women/wives

Janghidam a panacea to poisons aches coughs fevers

Authumbaramani promoting nourishment .vigourous growth and strength

There are many more as described in charaka and in susruta samhitha used in ancient India .(Given in my commentary to Susruthasamhitha in tabular form) The soma plant was always a wild plant and never cultivated and grew in stony soil,among rocks,crevices on boulder strewn hills .On Sahyadri they are grown in areas controlled by the Raja of Palghat (Kollanghot) and he has to bring soma plant for a sacrifice being conducted in Kerala . Soma is the Lord of the creeping plants(R 10.2,11.2 and 9.7.11.2)and it grows in the bright half of the month and withers in dark half .The plant is brought as a a cartload to sacrificial hall by the chief of the hilltribes (In kerala the Palghat raja).It is crushed between two stones squeezed between two pairs of boards ,the planks.Juice strained with piece of cloth(woolen)into a wooden trough the dronakalasa and into crooked pitchers.Green tinted yellow hued ,tawney coloured bright juice is described in Rgveda(10.2.1.1 ;2.9.2)Juice is offered fresh .Stale juice is poisonous and not fit to be drunk.(R 10.7.1.34).It is mixed with

barley ,curds and honey of the bee(R 8.1.4.8) which is another forest produce.The soma exhilarates like juice of wine(R 8.1. 2.. 12)was known to the people.Since it is freshly taken the ebriety is not due to alcoholic fermentation also was known.The fresh juice can produce nausea and vomiting in some people and then why was the worshippers in Southramani and other sacrificial rites taking this juice ? Because,it gives strength and valour to Indra in dawn,noon,and evening (R 6.3.20.2). The fact is that even when all the lowlying areas of cultivable lands are lost ,human race can still survive in hills and forests with forest produce and remain strong and healthy to survive draughts and famines and floods by such food.The preservation of forests and hillycrevices and the preservation of forest life and the hill people as such is actually the secret of continued existence of the human race on the globe.The story of Parasurama reclaiming the lowlying land of western coast from flood waters and the survival of human /royal race from the surviving wife of Krithaveeraya Arjuna and a hillchief in the Sahya mountains to sustain the race is thus extremely important for a historian of modern times.In Thrikarudra sacrifice Indra in company of Vishnu with the help of Maruths drink soma and fills his belly as a lake and with that became efficient to do great deeds (R 11.2 ;11.1.2).The worshippers who partake in soma drinking is immortal through his race as seen by Rgveda (8.6.6.3). What ingredient is responsible for this effect ?An astringent with narcotic effects but not alcoholic effects is responsible for strengthening and rejuvenation.The somalatha(Sanskrit,Karnataka and Malayalam) is called Aattukodi in Tamil.

Vedic fauna:-

Black antelope,bull,white antelope,monkey,wild pigeons, crocodile, elephants(Y 263.1)owl,cat,wild goat,mongoose,crane ,fishes,seagull,swans,woodpecker,pythons,rats,lizards,snakes,spotted deer,crabs,eagle,turkey,jackal ,doves,hares,cocks, chameleon ,dogs,ass,porcupine,kite,wolf,lion ,tiger,rhinoceros,ram,horse(Y

263-276), camels, frogs, cow, sheep and goats, buffalo (R 8.5.5.7) etc are named and their lakshna (morphological characters) uses and care and the diseases and cure for each are known showing how advanced the knowledge of the vedic Indian was. It is noteworthy that none of these flora and fauna are Arctic or non-Indian to support the farfetched view of the vedic Aryan migrating from some other place in the north or west. Balaganghadhara Tilak was the first to point out this fact. The luxurious vegetation of the tropical and temperate climate is known to the vedic Aryan means the vedic Aryan is Indian itself. And the veda is more ancient than the modern historians think and the vedic Aryan race of India too.

The cow in India:-

Used for agriculture, animal husbandry and as wealth and a sacred animal provided rich nourishment to people with milk, ghee, butter and whey and curds and a rich variety of food preparations made from them. Four types of bullocks are described as plough bullocks, cart bullocks, pack bullocks and temple bulls. (Uzhava kaala, vandikkaala, pothikkala, and ambalakkala). The cattle were kept in herds and there were herdsmen. No house was devoid of at least one cow. The number of cows, the number and size of the full granary determined the state of wealth. The cattle raids, expeditions to save the stolen cattle, victorious exploits of such expeditions etc are seen in vedic hymns, in Mahabharata and in sangham literature showing the antiquity, continuity of practice both in North and South alike. Cows were kept in walled enclosures for safety. Watch dogs looked after them. They could warn the owner and also attack the intruders. Cows were temptations even for great people like Viswamithra. Milching cows, making curd, butter, ghee, and keeping the nutrition of family was done by all as domestic duty of every day importance while some of the yadava families did it for barter and for service of king and people. There were stores of green grass, hay, and grazing grounds and pastures for herds of cows and it was common property of village and cows were fed on millet grains as a concentrated feed to increase flow of milk. Ample

supply of pure drinking water for them was from streams, canals, rivers, and lifted from wells. Treatment of cows against diseases and injuries was known and herbal cures were known. The barren cow and cows susceptible for abortion were treated. The good and bad cows as well as humans were distinguished on the basis of economic production, prosperity it brings, and the continuation of the races by fertility. Cows were offered as gifts of charity, as rewards for scholarship, and for religious merits and the number gifted varied with the economic status of the donor, their disposition (liberal or not) etc. Wealthy but miserly traders who do not give charity were commended to wrath of Gods in hymns. That means the middle man who is greedy was disliked even by the vedic farmer and his priest. And every one was eager to have good name, fame and divine blessing and did charity with liberal mind. Morphological physical character of the different cows is given much importance in the veda showing that they were aware of crossbreeding just as Mendelian way. Yajurveda 279-91 describes cows of varying colours on entire body, patchy, piebald, on one side of body, on other side of body, on face only, on ear only, on tip of ear only, spotted, white patch on leg, feet, forehead, back and so on. And it distinguishes the silky skinned, coarse skinned, horned, hornless, based on different horn size and shape, with long tufted tail, and stumpy tail and all sorts of hybrid varieties. Well nourished body and capacious udder (R 1.21.13.6; R 2.3.10.3) were good signs of a milchcow. The value of nutrition in milk and dairy products was well known. The dead cattle were disposed by scavengers who stayed outside the city walls. They also disposed of the human carcasses. The position of scavengers outside village/city was to minimize the unsightly and unaesthetic sights as well as to reduce smell of disposal including burning of dead bodies and smell of tanning. The leather industry, making of garments, cuirass, sandals, straps, thongs, whips, bellows, bottles, receptacles in sacrifices, musical instruments like drums covered by animal skin, horns and bone flutes etc. were carried out by the chamar/paraya scavenger people outside city walls.

Horses were pack horses, riding horses, chariot horses, war horses, race horses, ploughing horses and sacrificial horses. Their descriptions are given with due importance and good judgement and close observation. The girdles, trappings, spurs and heel goads, saddles, bridles, heel ropes, halters are all mentioned and how to look after them and care for them described. The horse's neighing when it approaches a mare is described. Horse breeding with utmost care so that each variety suited for each purpose was evolved is seen. The locally bred horses and the imported high quality war horses are known and used for different functions.

Thus animal husbandry, agriculture and trade and commerce and economy were well looked after by the class of vaisya, who were a group of travelers as well as settlers. They were accompanied by a group of musicians and musical band with different instruments both for entertainment and selling of instruments and the spread of art and sciences through the class of traveling vaisya happened from prevedic times and the fame and richness of India became widespread in foreign countries like Babylonia, Sumeria, Assyria, Egypt and later on in Greece, Egypt, Rome and the European countries. The continuity of this fame itself is evidence of the agricultural and trade and commerce economic importance of India. The predominance of vaisya class and Krishna as the representative of this class (krishi, goraksha, vanijya) in his childhood is an important factor since Krishna lived before BC 3104 when the pralaya took away his port city of seatriade and commerce, at Dwaraka. This period almost corresponds to Harappan and Indus Valley civilization is a fact we always forget.

5. Agricultural economy of Harappans and the ecology of their times:-

The Harappan culture and IVC had a very vast area and the rainfall and climate were varied in these sites .Therefore there were regional differences in varieties of crops grown here as seen from paleobotanical and archeological evidences.The entire area is arid and semiarid and towards the Kutch(old Brighukutchha)in Gujrath it has a anoopa or lowlying coastal (at and below sea level) climate with continuity of monsoon plains of Kerala,and Karnataka.The Anoopadesa of MahaBharatha and Bhagavatha is this lowlying coastal area extending from Gujrat upto Cape Comorin .(Krishna is addressed as the AnoopadeshaBhoopathy or chieftain of this geographical region)

Old theories of Stein,Piggott and Wheeler and that of Fairdervice and of Raikes and Dyson,and of Choudhary and Ghosh and Thapar are first cited here .

1.Stein (1937):- The extensive remains of dams called Gabarbands and human settlements in Mashkai-Jhalawan area suggest more favourable climatic conditions then.

2.Piggott(1950):- The inference from fauna ,wood needed for burning many million bricks and an implication of a flourishing agricultural background suggest a climate different from today.

3.Wheeler(1959):-Broad jungles and intermittent marshes infested with elephants ,tiger ,buffalo,rhinoceros and crocodiles existed (from their representations on Indus seals).

4 Fairservice(1967):- The 3 main trees in the area Acacia Arabica, Tamario gallica,and prosopis spicigera are enough to for local fuel and there were no tropical type biodiverse forests in Mohenjodaro area.The Harappan fauna suggest their dependence on grassland and an open forest country .

5 Raikes and Dyson(1961) Only 400 acre of forest land is needed for rebuilding of a Mohenjodaro.

6 Choudhary and Ghosh(1951):-The wood remains does not support theory of moist rain forest in neighbourhood of Harappa.

7 Banerjee and Chakraborty(1973):- Rhinoceros unicornis remains in kalibhangan was studied.they mention occurrence of Rhino in the Punjab during Mughal times.

8 Thaper (1977):-The use of unburnt bricks and occurrence of barley from Kalibhangan as proof of a dry climate during Harappan and Pre-Harappan times.

This show opinions for and against climatic change as given by various observers.

Climatic change is a global phenomenon. The climatically controlled ecological factors from a global research show continuous changing pattern but for a cyclical period and then returning to its original state. There had been glacial expansion between Ca 1000 and Ca 3000 BC. And also during the well known little ice age. Glacier expansions are generally associated with aridity of nonglaciaded areas.

Beltzner 1976:23:- warmest episode approximately 8000 to 9000 BP with evidence of cooling as early as 5500-5000 BP (BP is before present.)

So 6000-7000 BC warmest and 3500-3000 BC as cooling phase. National academy of sciences of United states(1975:132):- Period from 7000-5000 yrs ago was marked by temperatures warmer than those of today. The last 5000 years characterized by generally declining temperatures and a trend towards more extensive mountain glaciations, but not ice sheets, in all parts of the world.

Australian academy of sciences(1976:18):- The trend of air temperatures similar to this at ca 5500 BP. They also indicate a 2000 year cycle of cooling alternating with a warm period. The Harappan cycles are comparable to this both archeologically as well as from the scriptural details of Indian kaaalaganana and flood predictions etc.

Paleoclimatic evidence from Rajasthan:- (Singh et al 1974):- Except for the pre-holocene aridity, from 10000 BP to 3500 BP Rajasthan was generally wetter than today. Between 5000-3500 BP a markedly wet period was followed by a severe aridity between 3000-2000 BP. After 2000 BP according to Singh the climate acquired the present character.

10000 BP-3500 BP= 8000 BC TO 1500 BC (wet)

5000 BP-3500 BP= 3000 BC – 1500 BC(markedly wet)

3000 BP-2000 BP= 1000 BC – 1 AD(severe aridity)

AFTER 2000 BP = From AD 1 To the present day.(present climate)

During wet periods river and stream channels will revive and dunes will be stabilized. Sand dunes stabilize when rainfall exceed 250 mm/yr. Microlith-using ancestors in Rajasthan were inhabiting such stabilized dunes. Microliths were excavated from the body of the dunes. Multidisciplinary survey in Rajasthan by Poona University and central arid zone research institute of Jodhpur (Jodhpura) from the Pushkar area stabilized sand dunes study (dt ca 5000-6000 BP or 2000- 3000 BC) when calcareous formation was more (as time of dune stabilization). Climatic changes in from sedimentation changes of Malhar Rann show regular oscillations between sandy silt and calcareous sediments. Scanning electron microscopy of Quartz grains show Aeolian and fluvial conditions alternating with each other. In Nagaur district there were perennial rivers as shown by relic river beds in early and middle Paleolithic human settlements but now no such rivers exist. So in late quaternary period climatic changes has happened in Rajasthan. The evidence indicate in 5000 BP or in 3000 BC Rajasthan was a wet land and onset of aridity is placed about 3500 BP or about 1500 BC.

In semiarid regions ecology is on a precarious balance and even minor shifts in balance can spell disaster. In middle of second millennium BC the increasing aridity in the Rajasthan has put stress on Harappan civilization because of food scarcity. The other factors like increase in salinity, a rise of water table and floods in neighbouring places (so that food supply could not be shared), frequent floods in various parts of the land, invasions (the Assyrian attacks was at this period) especially jeopardizing the living by other means of trade, commerce etc for the nuclear urban areas might have happened at the same time.

So paleoclimatic studies are important for knowing the global warming that we face today. To face it and to overcome it we need

to know its history. Wendland and Bryson in 1974 put forth a theory that climatic change can affect vegetation every 50 years and a botanical change thus affects the culture in another 50 years (that is a total of 100 years). In India this is a Nakshathravarsa or saptharshivarsha and 27 -28 of such constitute 2700 years. This is doubled (one positive and one reverse order) to get 5400 years for one era or half of an era of 10800 years. Double of it is 21600 years the time for a praaana (jeevavarsha) and double of it is 43200 which is a Kaliyuga. So an oscillation of climatic change of 432×100 constitute a Kaliyuga and it started in 3104 BC and now in 2010 it is 5110 years past and in 1800 AD it had been 4320 or $1/10^{\text{th}}$ part of a Kaliyuga over. The 18th century saw the effects of the previous 100 years of industrial revolution and loss of ecology, forests, change in climate etc. And then started a rethinking of one's own karma in the next 100 year cycle. This will repeat forever. As long as human beings do not learn from experience and think for welfare of all this sort of manmade calamities will continue. So there is no need to worry over such happenings. Let us think collectively for the entire living things, for entire earth, and for entire cosmos and let us not exploit it over our selfish motives.

Tectonically controlled changes:-Based on chalcolithic settlements in the dry Ghaggar and Chautang in Rajasthan, the question of why such a big river suddenly dried up arose. (Page 226 of Harappan civilization ed Posshell. D.P. Agarwal and R.K. Sood) with figures show the Satlej and its flow path into Gaggar following a path east of Ropar, Sirhing, Patiala and Shatrana. The mighty Ghaggar with a bed of 8 KM wide is now extinct. The multitude of channels of Sutlej is mentioned in Mahabharata as a legend of Vasishta jumping into it causing it to split into Sathudri (a 100 channels). Since enechelon faults control the river's course, Ghaggar was prone to drastic changes even by minor tectonic movements. A major river to the east of Ghaggar was changing its course frequently. The channels of this are shown on a map as Y1, Y2, and Y3. Y1 connected to Ghaggar. Y2 followed a course merging with

Chautang, and then met Gagger near Surathgarh. Then the combined Y2 /Ghagger as a mighty river bifurcate at Anupgarh (Anoopdesa). The upper branch terminates at Maroth. The lower one ends in a depression at Bheriwala in Pakistan. A chain of tectonic events that diverted Sutlej and easterly rivers from Ghaggar and caused a depression into which the Ghaggar (old Saraswathy) deprived of its major sources of water died and disappeared (into a lakelike depression) is thus shown. So there is no guarantee that we will enjoy all the rivers that we enjoy today. The third Y3 was flowing further east, and joined Ganga through the Chambal (old Malini), and when it shifted further east it left various lakes in its course which are seen North of Bharathpur and in the vicinity of Mathura. This Y3 was the Yamuna and its present course is not the same as the old one.

When Ghaggar /Saraswathy was a perennial river it met the eastern Nara and flowed directly into the Rann of Kutch (Old Bhrigukatcha which was part of Bhrigurama/ParasuRama /Kerala/Mooshakavansa/Mahishmathy clan) and that is why it is called Anoopadesa (though now it is not in Anoopadesa after disappearance of the river system). At that time it did not meet the Sindhu river (Indus) and was a separate river called Saraswathy as the most important one in the Veda and it was the center of civilization and from there culture, knowledge, man and materials spread to various directions. The paleochannels indicate Saraswathy flowing directly to sea at Bhrighukatcha. The presence of archeological sites in the course of the paleochannels are many. Ghaggar was alive during pre-Harappan and Harappan times. By PGW period it had become dried up. The sites of this period are seen within the entrenched riverbed. Chautang has a number of late Harappan sites associated with it and Y 3 channel was a living river during PGW times (It existed till that time). Y1 and Y2 channels were more ancient and ended up before that period. In North and west Rajasthan tectonically unstable rivers were the major factor confronting human settlements from pre-Harappan times onwards. The annular disturbance of Tectonics in Lothal was

studied by aerial survey and showed an annular pattern of drainage. The reason for cutting of the Lothal dockyard from its feeder river and from access to sea as a port was either a tectonic uplift, or a eustatic fall, in the sea level and probable association with disappearance of Saaswathy/Ghaggaer system is correlated.

Raikes suggested tectonic disturbance impounding on Indus and consequent engulfing of Mohenjodaro under a lake of mud and water. If there was a lake around Mohenjodaro it would be a protected Jaladurga (natural watery fort like most of the Kerala land) and there should have been a Bund/a bundhana or Sethu/to connect it with mainland for food and transport. Agarwal thought that it would be a calamity and that would have killed all forests, animals, prevented their agriculture, food and forced them to migrate and local travel would be impossible. But possibility of a Bandhana /Bund or a dam (anicut) to connect with mainland and possibility of food grown around the township in villages cannot be denied and with boats one can have travels. Such an old bund existed (The Allahbund) in 1819 revealed by an earthquake. In 1926 when a floods happened in Nara river it was breached. (107 years). The bund was on Indus and 500000 cubic feet/sec water was pushing at it on a narrow front and yet it existed for hundreds of years.

Such bunds are possible in upper courses of rivers, esp in mountainous areas. There are lake remains in the upper remains of the Indus and Sutlej and they are from a Pleistocene date.

India is a land that has ecological and tectonic stresses throughout, just like any other country on earth. Ecological survival and finding out means for subsistence and for sharing and development still continued and will continue forever. When we examine the Harappan settlements we find that the greater concentration of large sites is in the central Indus system. It is broadly in and around a rough triangle with Mohenjodaro, Harappa and Kalibangan as three points of the triangle. Between Sutlej and Yamuna there are only smaller settlements. In Gujrat, in Kutch (Old Bhrighukutch) there is a major concentration of larger sites.

Consider the concentration at these four sites. What are the causes for such a concentration?

Agricultural land ? Raw materials? Minerals? Communication and transport facilities?

Why is even a smallest Harappan settlement having an urban nature and not a village type?

Towns/urban areas do not cater to food production but depend on surrounding villages for food and are centers for industrial and technical and administrative requirements of people. Food is supplied by village and the other services by urban centers in a mutual way. The Indus and Ghaggar valley with vagrancy of rivers in the upper tracts did not grow much food and were not major food producers from their climate. Agriculture was based on the cover and meander flood plains and in seashores and low lying wet areas of the monsoon. The biodiversity was in the tropics and the growers of food and forest goods needed the towns for their produce to be shared, sold and transported to other areas as a wide network. The need of a good transport and administration for such activities, and for protection of goods and personnel the cities and Rajasthaana (place or palace of kings) came up. The Brahmarshana (Saraswathi plains) of knowledge became the advisers of these administrators as well as agriculturists and trading people being the elders and the scholars. Thus Saraswathi and Bhrighukatcha and mahishmathy as the head of the Anoopadesa of the Dakshinapatha became very important and it happened in prevedic era (as Saraswathi is praised in the Rgveda itself). The methods to cope with all stresses including a change in farm produce due to climate and how to withstand each and every problem was studied logically by this university of Saraswathi scholars and they were considered a very important part of administration and education of kings and masses alike for a better living and better economy of state. The present economy of agriculture as capitalist farming also has the same pattern of development but with the difference that the old scholars were not doing that for a selfish motive and the present scholarship is for some private returns whether it be a PhD

or a job market or exploitation of masses for profits. So only the goal differed and process was same and that is what is meant by a Krithayuga and Kaliyuga functional change .

Why was there a dockyard in Lothal?

Why did Krishna in 3100 BC built a portcity in Gujrat ?

Why it existed there as Kusasthli of RaivathakManu before Krishna ?

Why select that location?

Does it has any relation to trade of timber and forest produce from the tropical rain forest and rice export of the lowlying seashores of Kerala?

Was it because of a flood or a tectonic uplift or a eustatic change that made Lothal away from the sea and made it defunctional ?

Was it the reason for the major economic and sociopolitical change that occurred after the Saraswathy drying out ?

Such questions take us direct to role of Kerala as the major supplier of its food and forest products to Kutch(Bhrighukatcha) which also was part of the Bhrighu land of ParasuRama and his ancestors.

Can I substantiate this theory of mine with the food economy of the Harappans as evidenced from the crops of the various sites studied in Harappan /IVC areas? Yes .We will now see the pattern of Harappan crops .

The economists sometimes think that there is a socioeconomic disparity between Harappans who eat Superior crops(Rice, Wheat) and those who eat inferior crops (Millets).But this is more of a ecological,geographical and climatological availability of food rather than socioeconomic superiority or inferiority.In a place like Kerala both rich and poor eat superior grain as staple food (Rice) because it is locally available and is geographically suited for growing.Similarly with wheat growing areas .The millets and other crops are grown for tiding over situations in areas where the rice and wheat are grown, as well as in areas where arid ,semiarid

climates prevail as staple food. Therefore when we study the ancient crop of Harappans we are studying the climatic conditions that existed in that particular site where the study is conducted (Regional).

Pre-Harappan food economy:-Mundigak in Baluchistan (Baluchistan is old Kekaya of India where Queen Kaikeyi, mother of Prince Bharata was born during Ramayana period).

Pre-Harappan Food economy of Mundigak in Baluchistan:-

1. Wheat . *Triticum compactum* Intermediate forms like *T. aestivum*, *T. sphaerococcum*. *T. compactum* was apparently *T. sphaerococcum* by its glume and grain shape and was indistinguishable from *T. vulgare* . Both species possessed dwarfing genes at S and C loci which govern their characteristics.
2. *Zizyphus jujube* . In both Sind and Baluchistan. *Z. mauritiana* both cultivated and wildy grown. *Z. mummularia* . The fruits are eaten in the hotter parts of Sind, Baluchistan .

The Harappan sites and their food :-

1. Harappa (Montgomery district .Pakistan).

Wheat . *T. compactum*, *T. sphaerococcum*.

Barley:- *Hordeum vulgare*, a small seeded six rowed variety

Peas:- *Pisum arvanse*

Sesame:- *sesamum indicum*

The wheat came from the granary area (stored) in stratum 3 and in a southern trench in stratum 2. Barley, peas and sesame were from stratum 3 associated sites.

- 2 Banawali (Haryana India)

Wheat . Not examined .

3. Lothal . (Gujrath India)

Rice . Imprints of both husk and spikelets

4. Rangpur (Gujrath India)

Rice imprints . Wild variety in marshes and cultivated.

5.MohenjoDaro and Chanhudaro(Sind Pakistan).

Wheat and barley.

In Mohenjodaro the sample of wheat was from BC 1650

.(Radiocarbon) and had 56 entire caryopses of wheat with several broken fragments.A single fragment of barley also was there.

Chanhudaro had enormous quantity of wheat caryopses,and from that 160 caryopses of barley could be separated.A single report of Andrus and Mohammed say Rice as seen in Harappan sites of Sind and Punjab.Pisum arvense and Brassicum juncea(mustard) also reported.

Mohenjodaro wheat mostly T compactum and the plumpest ones were T sphaerococcum.Luthra classified them as T aestivum subsp Vulgare ,and T aestivum subsp compactum .T compactum of harappa and Mohenjodaro was very similar .Chanhudaro wheat was preserved in storage bins .Shaw (1943)said all the variants of Chanhudaro ,Mohenjodaro and Harappa were T sphaerococcum.

Dimensions of modern wheat grains:-

No of grains studied	Length mm	Breadth mm	Thickness mm
T sphaerococcum Humped grain(with constriction) 50	Average 5.05	2.81	2.81
T sphaerococcum Humped grain without constriction 50	Average 5.16	2.81	2.71
T.compactum 50	Average 6.02	2.63	2.38
T.aestivum 50	Average 6.66	2.92	2.76

Areas of each length X breadth X thickness=

T spherococcum with constriction	39.875305
T sphaerococcus without constriction	39.293916
T compactum	36.681588
T aestivum	21.3674272

Generally if Length/breadth indices a and Length/thickness indices are under 2 and Breadth/Length index above 0.5 it will be T sphaerococcus. The others have L/B and L/T indices above 2, B/L index below 0.45. The Harappans and Mohenjodaro, Chanhudaro people were growing all these varieties of wheat as the present people in those areas do.

Chanhudaro barley was 4.3-5 X 2.2 mm (hulled) and 4-5 X 2 to 3 mm (naked ones).

6. Kalibangan (Rajasthan India)

Two samples of charred food grains (Agarwal and Kusumgar) in early phase of Harappan culture (carbon dt 4040 \pm 125 BP and 4025 \pm 110 BP or around 2000 BC) was not studied. But pre-Harappan and Harappan samples were studied from other sites. Barley :- *Hordeum* species. There 24 cultivated species of Indian barley. 5 of them are two-rowed. 19 are six-rowed. The types are further divided to those with husked (adherence of lemma to caryopsis) or huskless (naked). The 6 rowed husked type is now widely grown in India. The two rowed, both husked and huskless are rarely grown. Exceptionally small barley grains were excavated from Kalibangan. To classify them was difficult and with samples of modern barley from Indian Agricultural Research institute a comparative study was done.

The small grain size was seen in samples from Durgapura in Rajasthan (IARI) but it was rare than the medium and large grains from the same locality. Kalibangan grains were 3 to 5 mm smaller than the present variety of barley. When carbonized there is a reduction in size and this is one cause. The hulled barley does show only very reduction (since it has adherent lemma). Kalibangan

carbonized grains are much smaller than the carbonized shrunken large barley and is more similar to the rare but very small grains that are still seen cultivated in Rajasthan (Durgapura). The hulled varieties even resembled wheat grains with a tiny transverse groove. The carbonized barley of Kalibangan was found in three containers labeled wheat. The spike and palea were absent. The grains varied in size. The hulled ones outnumbered the naked ones. For every 100 hulled grains there were only 5 naked grain. Size of hulled grains varied from 2 by 1 by 1 by 1 mm to 6 by 4 by 3 mm. The average length, breadth and thickness for 100 grains was 4.59; 3.15; 2.32 mm. Greatest dimensions being 6 ; 4 and 3.5 (not for same grain) Smallest dimensions 4 ; 2; 1 . (not for the same grain) for length, breadth and thickness.

Naked barley grains (6 examined) had average 4 X 2.75 X 2.08 mm. The transverse ripping occur during drying of grain. (contraction of fruit shell devoid of palaea.) The barleys cultivated by Harappans at Kalibangan was varieties that produced hulled grains. The naked ones less common. But they were known. The presence of twisted hulled grains showed that they were produced by a six-rowed variety.

Wheat at kalibangan:- only 5 grains with a rotund, globose surface and a distinct dorsal hump seen among the barley grains. They were T spherococum. Grains intermediate between wheat and barley occurred. Their rare occurrence with hundreds of barley grains suggested either an aberrant form /cross breed/ or a few wheat plants that grew in a barley field. Rice was not found in Kalibangan.

Cicer arietinum (Chickpea) with squat shaped, angular and pointed at one end was found (The gram). Three carbonized seeds with 5-7 X 5-6 X 4-6 mm were studied.

A single seed of Pisum arvense (2.5 mm dia, 0.5 mm long) was seen.

Crystals of potsheds with no organic material showed selenite gypsum in transparent crystalline form.

7. Surkotada (Near Adesar, Kutch India)

Samples from 1970 BC to 1660 BC were studied. Two of the charred lumps yielded 574 seeds an overwhelming majority being wild plants. Seven % were cereals.

The plants identified were:-

40 grains of setaria species of millets including the cultivated species and two wild species of green millet (*S. viridis* and *S. verticillata*).

The finger millet (*Eleusine coracana*) or Ragi was identifiable.

257 were seeds of grasses mainly of wild variety. 15 varieties were *Phragmites karka* (reed grass). The rest were wild grass

Andropogon, *Brachiaria*, *Panicum*, *Echinocola*, *Eragrostis*, *Digitaria*. These are varieties that grow as weeds on a disturbed soil in and around cultivated fields and settlement sites or around sheets of water and moist places.

47 seeds were of sedges comparable to seeds of *Scirpus supinus*. 13 glumeless nuts comparable to *Carex* species and 38 resembling *Eriophorum* species were also seen as sedges.

Cheno-amaranthes:- Among 13 seeds 3 were similar to *Amaranthus* species, 8 ornamented specimens with *Atriplex*, probably *griffithii* / *stocksii* a plant seen in salt marshes.

Polygonum:- 215 triangular seeds of this genus. *Euphorbia* species:- 12 obtusely angled seeds of *E. pycnostegia*.

Food economy of late Harapans:-

1. Daimabad Ahmednagar dist Maharashtra :-(Savaldia culture inhabitants)

Jowar (sorghum)

Barley (*Hordeum*)

Lentil (*Lens culinaris*)

In period 2 only barley (*Hordeum*)

Period 3 a barren and weathered deposit corresponding to period 1 at Prakash (BC 1500) had a food economy of barley, peas (*Pisum*), Horsegram, lentils, Mung (*Vigna radiata*), Indian jujube.

2.Daulatpur District Kurukshethra Haryana Vigna mungo and Hepper(*Phaseolus mungo*)

The conclusions made by the authors:-

1.The diet was a balanced vegetarian one.

2.Carbohydrates from cereals like wheat ,barley,millets etc (and rice at Gujrath/Bhrighukatcha),

Proteins from peas,chickpeas,vigna and horsegram,Fats from sesame and mustard.Vitamins from fruits like jujube.

3.Geographical variability of crops:-

Wheat at Mundigak,predominantly wheat with some barley in Mohenjodaro, Chanhudarp and Harappa,wheat at Banawali, Exclusively barley in kalibangan,millets setaria and Eleusinae at Surkotada,Rice at Lothal and Rangapura shows the vast Harappan empire having different food economy in each regions (Just as today) and this is due to geographical peculiarities,rainfall etc .The situation is comparable to modern food economy of South Asia . With climatic variations from arid to subhumid ,gradations both in precipitation and temperature and variety of soils this is natural now as well as then.This vast region was not different then from what it is now .

4.Present crops in Baluchistan ,Sind and Punjab of Pakistan :-
Triticum spherococcum

Now only in Baluchistan.

T.aestivum ,*durum* and *trugidm* ,*Hordeum distichon* and *vulgare* now extensively in Sind and Punjab.*Setaria italica* and

bajra(*pennisetum typhoides*) are important millets in Baluchistan.

Paspalum scrobiculatum in Punjab Several varieties of jowar (*sorghum bicolour*) in Sind and Lower Baluchistan. *Panicum miliacium* (cheena), *P sumatrense* (miliare) the later especially in Sind. *Eleusine coracana* occasionally in plains and lower hills of Indus delta .

5. In Indian Punjab, Haryana, western UP wheat is predominant crop grown along with bajra and barley. Rice is comparatively unimportant here. In Rajasthan desert Bajra is the important crop along with jowar and barley. Maize also cultivated which was introduced in historic period. A drawing on a Mohenjo Daro potsherd shows sorghum and crops of millets.

6. Environmental analysis of these crops:-

Wheat in areas of annual precipitation between 37-110 cm. But can also grow in areas with less than 22 cms rainfall if irrigation is there. Rainfall should be well distributed over the year. Alluvium yield good wheat crop with or without irrigation. In Rajasthan desert water is the limiting factor for cultivation. Alkaline soil with high % of soluble salts in Haryana, Punjab and Rajasthan with lack of water makes them less productive. If these are provided agriculture is possible. Local wheats of this region by centuries of cultivation are able to withstand adverse conditions. They are drought tolerant and grow in areas of low soil fertility with little precipitation. *T. sphaerococcum* especially is highly resistant to drought and that is why it was cultivated in North west India from earliest times. It requires a cool climate at the time of sowing but sufficient warmth devoid of humidity needed at time of grain formation. Desicating hot winds affect its growth adversely.

7. Barley is both heat and drought resistant and grow in areas too dry, too saline to carry a good wheat crop. Require moderate precipitation, sunny weather. Tolerant to alkalinity, frost, drought and less exacting in nutritive requirements than wheat. It is grown even without manuring. It is grown with wheat in Punjab and UP as an insurance against weather hazards and is also mixed with gram. Its flour is mixed with that of wheat in making chappathi (a North Indian food).

7. Sesame or Thilam is an essential seed for ancestral rites and needs a warm climate, cannot withstand frost, continued heavy rains, or prolonged drought. Waterlogging is highly detrimental. It thrives well in sandy loams like sandy semidesert soils of Rajasthan, clayey soil or black cotton soil of central India. It is a

rotation crop with wheat, gram, cotton, ragi, jowar etc. Also grown mixed with bajra, jowar, cotton as a measure against total loss. Manuring done in the mixed cropping pattern.

8 *Setaria italica* is suited for low rainfall areas .(50-70 cm). A touch of frost is fatal. Millet favours ordinary red loams, very light ashy soils, black cotton soil. It is either grown alone or with cotton, ragi, *Dolichos lablab*, or in rotation with sorghum and *pennisetum typhoides*. Manure is seldom applied unless it is under irrigation. Just hoeing or working with a blade harrow is enough and no other further effort needed. The grain is used also for cage birds. *Setaria glauca* is grown on light soil with moderate rainfall without manuring or irrigation.

Eleusine coracana is much like *setaria* but grown in areas with under 625 mm of rainfall , irrigation becomes essential. It stands salinity better than any other crop.

9. Rice (*Coriza sativum*). Suited for areas with rainfall . In tracts with rainfall below 200 mm it can be grown provided it is supplemented with irrigation. Waterlogged conditions are most suitable (Therefore in coastal lowlying areas best). This is the reason for paddy cultivation in east as well as west coast of India. These are the only two areas where Indians can grow rice naturally .

When we know these climatic features suited for each crop, the crops in Harappa and IVC period and the crops we now cultivate we will understand the conditions are not different from what it was in Harappan or pre-Harappan times as far as agriculture is concerned and it is better for us to follow the ageold experienced type of agriculture even now , because the regional factors have to be applied in agriculture for best economic production . Baluchistan, Sind , Punjab which were extremely low rainfall areas , droughts and adverse soil conditions are still so . And if Bakra naganj was not provided for better irrigation we would not have produced a Punjab green revolution . Irrigation has to be practiced

in those areas .The use of river alluvium if made use of can somehow reduce the limiting factor of water scarcity .That is using flood plains for cultivation was a practice which Harappans knew and used for millennia and precipitation pattern during Harappan times were similar to what it is today.Irrigation mostly natural ,just like we practice today in farming in Sind was being done then also.

Presence of only barley in Kalibangan suggests a hard environmental calamity ,salinity and alkalinity of soil unsuitable for wheat cultivation,around 1660 BC .The most drought-resistant wheat variant *T.sphaerococcus* in other Harappan sites also suggest the drought that occurred during Harappan times.The finding of late post-Harappan Surkotada of setaria,Eleusine and thousands of wild seeds gathered by people show a peculiar biodiversity. Whether it was from the neighbouring Gujarat and beyond that the people got such a wild collection is not known.

The status of rice :- Only in Gujraht this is grown and not beyond that in North and North west India simply shows the climatic conditions of monsoons in the Gujarath region which is in a line with monsoon Kerala,Karnataka,Maharashtra .The higher rainfall ,the availability of a network of rivers and the lowlying waterlogging for rice cultivation this is not a surprising fact.In Lakhpat which is a desert area and where rice is not grown since 1762, about 150 years ago a sufficient freshwater supply was derived from an affluent Indus channel and rice was cultivated for a short period between Lakhpat,Shera and Mundhan.The rice cultivation in Lakhpat stopped in 1762 when a bund was constructed at Mora by a ruler of the Sind ,to divert Indus water to his territory (Raverty 1892: Oldham 1926).And considerable quantities of rice was grown in Bikaner (Todd 1832).That is if water requirement is met rice can be (but less successfully than in high rainfall low areas) grown even in areas with low precipitation.The Harappans were aware of this crop .I have shown

examples from scriptures and from Vedas for the evidence of knowledge of rice in another chapter.

If historians and archeologists are arguing that Harappans knew nothing about rice and nothing about horse they are having a self-contradictory statement and so too their Aryan invasion theory.

It is noteworthy that in Veda or in old texts we do not see the word Arya .It is a term that is used after BC 500,that is after Budha,who profusely use that word .

1.Who are Aryans? If they came from central Asia with their Vedas to teach Indians they must know of horse and should not know of rice .

2.If they are people from India itself they will know rice .Because they were exporting all forest goods and timber from Kerala/ Karnataka /Sahya areas and they must have contact with these rice growing people.

3.Since veda speaks both of rice as well as horse the people who do not know of rice and know of horses alone cannot be the vedic Aryans.

4.It has been proven that horse is known in India from 17000 BP .So ,the argument that horse is not seen in archeological remains, cave paintings or in literature of India is disproved.

Since the veda speaks of both horse and rice ,wheat ,millets and all the agroeconomy of entire land and its seasons and seasonal crops ,the vedic people must be Indians .And Indians who have been wellversed with the biodiversity of Tropical monsoon areas ,especially South India.The conclusion therefore has to be that the Aryans are Indians .They had gone out for trade and commerce and established a very wide network of village and urban centers is the best possible solution.The view of Asko Parpola that the Indus valley people are Dravidians is therefore coming to this truthful conclusion.

The reason why the word Arya is used by Buddhist writers and Budha himself is that ,the regional word Araya(alias aracha/ariya

/arya)was being used by the teachers by that time since Budha insisted on teaching in regional languages. So the claim that the Arya came from poles cannot be true. It was the Dravida who called himself an Arya when he/she had reached a stage of wisdom who went out and came back when conditions were not favourable in the distant regions who was responsible for spread of Indus valley culture abroad.

Methods of cultivation of Harappans:-

In kalibangan a area of field preparation through furrowing was seen.

In food plains of Indus wheat and barley were cultivated without ploughing, manring, or providing additional water even now and this was done by Harappans. They surrounded fields with earth embankments, possibly along banks of natural water /flood channels (Bunds /Bandhana). The natural fertility of the alluvium was exploited together with the annual inundation just as it is done today. This requires no or minimum tools for agriculture. There is but evidence of a rake or harrow in the sites as evidenced from the signs on Indus and Harappan seals.

The statement that tilling is not essential for germination of wheat and maize but needed only for weed control(Hindustan Times May 1, 1979: Union agricultural minister M.S. Barnala's statement in Lok Sabha PTI News April 30, 1979) is here noteworthy.

To achieve minimum tilling a bullock-drawn till planter to shear off soil crust and stubbles, open a furrow, sow seeds, apply fertilizer in a single run was experimented with Punjab Agricultural University of Ludhiana. Since Harappans knew bullock cart and the plough they were doing minimum tilling for maximum results.

They were using gypsum crystals as fertilizers as a potsherd from Kalibangan showed it being stored. Even now we use this chemical for reclaiming saline lands and render them productive. Gypsum occurs profusely in Rajasthan deserts. Large deposits are in

Bikaner. Ground gypsum is used as a surface plaster for conserving moisture in soil and for aiding nitrogen absorption from manures. It reduces salinity and alkalinity of soil where sodium ion is replaced by a calcium ion. (Gypsum is calcium sulphate $\text{Ca SO}_4 \cdot 2\text{H}_2\text{O}$).

They knew cropping patterns and rotation practices as the Kalibangan furrow shows mixed cropping. Mohenjodaro, Harappa and Chanhu-daro mixed wheat, barley, gram other grains also suggest this. Especially in Chanhu-daro this is evident. The practice as insurance to weather hazards is still followed. Both wheat and barley is seen in granaries showing the people of North India were making chappathy as of now.

The Surkotada pattern also shows the habit of food gathering of Harappans from forest produce. Whether it was for a type of gruel or as a medicinal purpose are not yet thought of. Or was it for a classification and teaching of the biodiversity for someone who had wanted to know of it? To be sent to that person abroad as a sample biodiverse universe of tropical forest as Hatschek or the European and Greek scientists after her to make Botanical gardens?

Harappans existed in all sites of OCP ware. And food economy of OCP ware included rice, barley and gram in Atranjikkara. In Neolithic economy of Chirand in Bihar (Chirand and Chirand is similar) was having rice, wheat, barley and pisin. The introduction of these crops (wheat, barley, gram, pisin) to beyond the borders of Harappan empire which had a drought climate was done by Harappans. They introduced rice to areas where a wet and waterlogging condition existed but not to drought areas showing that they were well versed in the agroeconomy and domestication of plants for food and fodder and for other purposes.

Rice is the crop which the oldest records (both wild and cultivated) exist from Neolithic Koldihwa dated 7000 yrs BP (5000 BC). Why historians think that it was introduced into south India by North Indians via eastern Rajasthan into Maharashtra and then to deep south (Vishnu-Mittre 1978) baffles my understanding. A tropical waterlogged, high rainfall area with so many varieties of wild

species of grass and grains ,South India with its monsoon climate should have been considered the original home and Harappan culture as same as that of South indian /North Indian (why people differentiate south and north India as two different countries ?They are different in climate but are continuous .To think that a person from Africa and Iran or Russia has to come and introduce and connect a North Indian with a South Indian looks absurd to me.).Indians as a race and with crossbreeds between several races and keeping each race as far as possible without being destroyed (as different species of wild and domesticated plants and animals they know of as great biodiversities of nature and as God's special boons) and with its purity of morphological characteristics by inbreeding (just as they know what we call a Mendels law) is more plausible .Because of knowledge of agriculture and Goraksha associated with it,because of wild and domesticated plant differences learned from observations they had developed their morphological classification of all living things appears more logical to me.

In Susruthasamhitha ,which was codified at least 200 years earlier than Koutilya's Arthasasthra we see a scientific morphological ,functional classification of living things .The morphological classification in the veda is given in another chapter of this book.

Susruthasamhitha on seasons

The Utharayana is beginning with Hemantha end and sisira beginning.The seasonal order is Varsha,sarath,Hemantha,Vasanth,Greeshma and Pravrida .Susrutha says in Kasyapa and Athreya works Hemantha and sisira are same and Pravrida and Varsha are same as far as medicinal people are concerned and they are treated alike.In Simhala the cold and heat are always equal in all seasons.In Madras presidency the Margaseersha and Pousha are marked by seeing the first flowers on

mango trees. In vaisakha they become small unni mango, and by bhadra and Aswina are mature fruits. (For this the food and breeding cycle of the small insects which pollinate the mango flowers also help. While I write this, in 2010 for the first time in such a long historical prehistorical period, the cycle has changed and in Kerala the time of mango flowering is changed due to excessive warmth.) In the end of Greesma according to the flow of winds in the oceans on either side Bharatha gets rains. Kasyapa says the nature north of Ganga is Hemanthaprakrithy and south of Ganga is Pravridavarshaprakrithy. Depending upon this the agriculture also varies.

In rainy season the air contains watery atoms and the earth is surrounded by disintegrated organic matter. In all water sources dirt accumulates. At that time the plants take dirt and become less potent. The flow of pitha increases. (bile). In sisira sun dries up all. The pithajala (bilious humour) becomes dense and at that time the diseases of bile happen. In end of sisira the sun's heat decreases and wind carrying moisture blows. Waters are clear and clean. Cold weather comes and plants become matured. Sleshma (mucous) increases. And in vasantha when the mucous becomes liquidified diseases related to sleshma happen. In hot season the hot winds take away all water from air. There is drought. Plants and grains become less watery and dry. Air increases and expands. With the first rain this increased air spreads in entire body and creates diseases of vaaatha (wind).

Dosha	Increase	Beginning of disease	End of disease
Pitha (bile)	Rains	Beginning of sisira	End of sisira
Shleshma	Sisira	Vasantha	Venal/summer
Vaaatha	Summer	First rain	Beginning of sisira

Vasantha or spring is the morning of an year, summer is the noon, and first rain is the evening. Rainy season is the twilight of year, beginning of sisira is midnight, and end of sisira is early

morning. Thus Makara (Utharayana) is the early dawn and Karkitaka (dakshinayana) is the twilight of samvatsara. The EASTERN WINDS remove dosha and tiredness. It increases acidity and cause dosha of raktha and pitha (bile). It increases wounds, poisons etc. Among the four winds the SOUTHERN WIND is best for strength of body. It gives strength to one's eyes. It pacifies the blood. Removes the pitha. It does not increase vatha or pitha. Western winds will take away the oily part from body and reduce veerya and sakthi. Northern winds increase the mucous secretion from nose and throat. It increases the strength and destroys constipation and poisonous effects on body.

In Anoopadesa (near lakes, kaayal, rivers, canals, forest etc in a low lying area) people are fatty, soft bodied, handsome, with vaathakapha prakrithi. In Jangaladesa (plains, low hills and grasslands) rainwater does not collect and flow away quickly and hot winds blow the entire year and people are strong, with heavy muscles, and vaathapitha prakrithi. The two types of prakrithi combined is the Sadhaarana desa. There people have equilibrium and body is healthy.

Annam :- Food or annam as well as the body are made of the five elements. Taking food and medicines is to give what is required for the body at certain periods. Therefore taking food and drinks is part of medicines. Annam is needed for growth, health, strength, and for function of all organs including mind. The nature of food, its measures, the opposite food taken together, certain food unsuitable in certain seasons, lack of proper cooking etc can lead to annam itself being cause of disease. Therefore all these are to be considered when we select our food (Soothrasthaana Susrutha 46.498; 4-99; 54.9). The elements in a food item could be good, bad or neutral.

Clarified butter and water and milk and cooked rice are good for all human beings. They will not be made into poison even with other foods. Fire, alkali, poison, that which produce burning and pus formation should be avoided because they lead to death. There are some food items which are important for health and their digestive

property and functions. Of these 60 types of paddy grains, 22 types of beans, barley, Wheat, and corn are mentioned. If these are grown in unsuitable soil their quality decreases. If grown out of season, if infested by pests, if harvested before maturing, and if used before keeping paddy grain for at least an year, the quality of food grains decreases.

One should not eat dry meat, or dry smoked fish, flesh of old, diseased and newborn animals. Susrutha does not consider the eating of eggs as good for health.

About fruits Susrutha says:- some are eaten green and others after becoming mature. One should not eat fruit that came out of season, the immature fruits, more matured and eaten by insects etc, and also from a diseased tree. Susrutha describes several vegetables, green leafs, flowers, sprouts of seeds, mushrooms, oilseeds, about 20 roots and tubers and the tender parts of palms and coconut tree etc. Daadimum (pomegranate), Aamalaka (Emblyc myrobalan) draksha (Vitis vinifera), kharjura (date or phornis sylvestris) parooshakam (Grewia asiatica) raajadhaanam (Mimusops hexandra) Mathulungam (Citrus medica) Vaasthukam (Chenopodium album/also called swethahamsapaadam or chilli) Chukku (conchorus) satheenam (Pisum sativum) Moolakapothikam (radish) mandookaparni (Hydrocotyle asiatica or Pennywort) jeevanthi (Dendrobium macrei or swallowwort) etc are also in his list.

For keeping the hair always black and without developing baldness Susrutha gives 11 ingredients to be made into a paste and then add to 7 prastha (11 liter) of beejakaanda essence and keep for 10 days in an iron vessel that is tightly closed. Then taking one aadhakam (6 ¼ liter) oil of vibheethaka seed (terminalia belerica) is added and then heated slightly. Keep in another iron pot for maturing for one month and after that apply on head and do nasya in nose every day. The food should contain greengram every day (Phaseolus mungo).

In this he uses Adhaka and Prastha for measuring liquids just like the farmers do with grains.

For curing fistula and sinuses he takes 6 ingredients in equal measures and water in 1:16 ratio and heat in mild heat and make a solution .The vegetable oil is taken 1/4th quantity of water added ,and add this to the solution to get a equal density and fill fistule and sinuses with this .Here 1 :16 :4 is the ratio taken just like the Harappan weights and measures.

The classification of living things by Susrutha :-

1 Animals :-

Classification according to origin:-

Jarayuja:- sasthanani or mammals that deliver children and have a jaraayu(placenta).

Andaja;- from eggs.Birds,snakes,reptiles like common lizards,tortoise,crocodile

Swedaja:- from heat and sweat .Worms and insects

Udbeeja:-from plants .The tadpoles and glowworms are included in this and the scientific nature of this is doubtful.

Classification according to their locomotion:-

This also includes their habitat and food habits.

Chathuspaath worms with 4 legs

Ekasepha with one hoof

Jalesaaya which move in water

Khaga which move in sky

Kravyabhuja which are carnivores

Mriga which move in forests

Pasu are animals that eat grass

Sareesripa which are moving on belly Reptiles

Vyaala big animals with long horns -a great elephant and a crocodile

The beings with a backbone are divided into anoopa and jaangala depending upon their habitat.Jangala were of 8 types (Jamghaalam like deer,Vishkeeram like cock and hen,prathundam like a parrot, guhaasayam like lion,prasaham like kite ,parnaamrigam like monkey, vilesaayam like rabbit,rat,and gramya which are all domesticated beings living in village.)and Anoopa were of 5

types.(koolachara like elephant and buffalo,plava like hamsa, kosastha with a shell like molluscans ,padeenam with elongated leglike paddles for example tortoise and crocodile,matsya which are living in saltwater and in freshwater)

Classification of plants:- Plants are living things which are sthavara (fixed by roots).There are 4 types.

1Vanaspathy:which give fruits without a flower

2 Vriksha:- Fruits formed from flowers

3.Veerooda:-which spread on floor and trees and supports with tendrils

4.Oushadi :- Herbs which are destroyed when the fruits mature

Plants grow depending upon soil,rithu(season)and water (Sareerasthanam 2.33).Soil which is soft ,without any breaks,with black,red and yellow colour and without sand is usually fertile.This type of soil indicate that there had been agriculture there before in the past.If there is availability of water ,the plants grow.The land which has uneven surfaces ,lot of stones,and anthills ,and used for funerals and for killing prisoners is not suitable for agriculture.The quality of soil is seen in the plants that grow there.According to the five elements and the six guna are the soils to be classified.

Soil where Prithwithathwa predominates:- contain stones ,and is heavy ,fixed,and smoky dark colour .Only certain types of grains and trees grow there.

Soil with predominant jalathathwa:- cold,white,with lot of dirt and is best for grains like paddy,for green grass and for young trees

Soil with agnithathwa:- Different colours,with small stone partiles.Only yellow grass grow in sparse distribution.

Soil with vaayuthathwa:- grey colour.Trees with solid porous nature grow.

Soil with akaasathathwa:- dark with increased water content.For small plants ,algae(paayal) and for weeds this type soil is essential.In soil with property of water and earth ,plants for doing virechana(to produce loose motion)grow.In a soil with property of agni,akaasam and earth,plants for vamana (to produce vomiting)

will grow. In soil with more than one property plants with more than one medicinal value grow. The vaidya (doctor) has the responsibility of collecting the small plants and algae etc which grow in soil with akaasaguna for the sake of making lifesaving medicines. (Soothrastraana 36.5-6). They have some rare samsamana properties (healing). Algae and fungi were thus used in 500 BC as rare healing medicines. Their antibiotic property was noted by those ancients.

Sadharanabhoomi contains all the 5 thathwa and their properties. It is best for growing medicinal plants. The plains between the anoopa and jaamgala is the sadaranadesa (su 36.10). The soil is classified based on its form, (the size and shape of sandgrain), its colour, fragrance, taste, touch, and its sound. The rasa or taste comes from water within the soil. The cold oushada are best grown in cold soil. For plants that increase heat, hot soil is best. Since rainy season is the period when the plant is collecting its strength, the strength of oushada is less in that period. Collect cold medicines during rainy seasons. At that time the plants are more sweet, peaceful, and cold. All plants should be protected from worms, insects, poisons, severe sunlight and heat and cold, and from sharp instruments. Each of the organs of a plant is compared to corresponding organs of a human body by Susruta. One plant with more organs than a human body is the lotus and it has bisam, mrinaalam, padminikandakam, padmapushkaram, and kesaram and the stem and leaf is always above water.

Susruta then classifies plants in two different ways. First he organizes plants as 35 varga (classes). Each is given a Varganaama (name of a prominent plant in that class of plants) as a generic name. Then gives each of its members in order of its medicinal value. 35 classes of plants are thus given medicinal importance. But class 3 and class 22, he also includes things from nonplant sources since these also have similar medicinal properties.

Ambasthaadi, Aamalakaadi, Anjanadaadi, aaragbadaadi, arkaadaadi, dasamoolaadhi, elaadhi, guduchyadi, kakoliadi, lakshyadi, mushkakaadi

hi,musthaadi,nyagrodhaadhi,kaneeyapanchamoola,mahathpancham oola,vallipanchamoola,kandakapanchamoola,thrinapanchamoola,p aroosakaadhi,padolaaadhi ,pippalyadhi ,priyanguadi,rodhradhi, saalasaraadhi,saaribadi,surasaadhi,shyaamadhi,thrikatu,thriphala,ut paladhi,vachadi,varunadhi,vidarigandhadhi,veeratharuadi and vrihathwadhi are the 35 classes.408 different plants are thus grouped into 35 classes based on their common medicinal property.

Then he divides plants with medicinal property into samsodhana, samsamana,samsodhana for virechana and for vamana and for sirovirechana are then subclassified .Samsamana are also subclassified as vaathasamsamana,pithasamsamana and sleshmasamsamana listing plants belonging to each variety . The classification of grains according to their food quality is a alaborate one (Soothra .46;5-52;144;344).:

1Dhanyavarga :- There were three types of paddy cultivated in BC 500 during Susrutha's period.

Saalivarga:-17 species of Saalinellu(paddy called saali),11 species of sasthika and nine species of Vrihi were cultivated in India .Total of 37 species of paddy alone were traditionally grown.

Kudhaanyavarga:-16 species were grown.Koradooshakam, shyaamaakam,Neevaram,santhanu,varakam (varakanellu of the Tamil people),udhaalakam,priyangu, madhoolika,nandimukhi, kuruvinda,gavedhuka,saram,varukam,thodaparni,mukundakam,and venuyavam(the seed of bamboo) .

Sameedhanyavarga or leguminosae :- 10 varieties were cultivated. of these Vaidalam (parippu)itself were of 11 species. Maasam ,kulatham,thilam,yavam,gothuma(wheat),samba,kusumba,atahsi and sidharthaka are other varieties.

2.Phalavarga:- fruits

3.saakavarga :-green leafy vegetables,small plants ,cheera etc

4.pushpavarga :-

kovidaram,salmali,vrisham,agastyam,madhusikguru,kareeram,rakt havrksha,nimbam,muskakam,arkam,asanam,kudajam,padmam,kumudam,mallika,malathy,bakulam,paathaalam,naagam,kumkumam,chembakam,kimsukam,kuranthakam were cultivated for the medicinal value

5.Udbheethavarga:- The parasites that grow on other materials .The fungi as per modern classification.

They were of 5 types for susrutha

Ikshuja which grow on the stem of sugarcane and can make body cold

Kareesa is that which grow on cowdung and increase wind and heat

Kshithija is that which sprout from earth itself (the mushrooms).It is difficult to digest them but they will not increase winds

Pathalam is mushroom on haystacks .It reduces thridoshakopa

Venuja is that formed on bamboo and cause increase in winds.

6.Kandavarga include vidarikanda

,sathavari,sringataka,pindalooka,madhyaalooka ,Hasthyaalooka, rakthaalooka ,Indeevara and Utpala etc .About 393 plants and their uses are given in Susruthasamhitha (for medicinal purposes alone).showing the knowledge of the people of that period.

Most of these being cultivated and classified and codified in 500 BC were also being in demand in Egypt,Babylonia,Sumer,China, and Assyria in prehistoric times indicates the antiquity of the agricultural knowledge of the Indians and their trade ,transport economy based on agricultural products.The knowledge of seasonal plants ,their uses and the monsoon winds etc are noteworthy since it represents the trade roots and routes of the people of the land.

Panchaayathana ,allied arts and crafts in vedic India

We have Panchayaths even now in India. In Vedic India it was called Panchajana. In Brihadaranayaka ,sareerakaBrahmana 17th manthra we find the term pancha panchajana .

Aayathana is a house or place of dwelling. The dwelling place of the panchajana is the Panchaayathana. This term is the name of a kulasangha of agriculturists and artisans (who discarded their agriculture and took to industries and trade and commerce of their industrial as well as the agricultural products of the village. The assembly of the entire panchayathana or people of the village/ urban center as a guild or kulasangha is called Panchayathana and Panchaayathi.

The civilization of forts, fortresses, walled towns, cities with many gates, are referred to in veda. This cannot exist without different occupations ,trade and commerce ,skilled crafts, planning etc. The settlements in riverbanks, and when they overflow in the interior parts was the rule. The residence shifted according to seasons so that there was not much loss of life or biodiversity. Securing fresh fields and pastures and expeditions to get new settlements was known. Majority lived in villages. A few walled cities were present. These were for defence,,for storage etc. The existence of wellplanned cities as described in the veda has been proved by Mohenjodaro and Harappa and other IVC sites.

“We offer praises to Rudra in order that all beings in the village be wellnourished and exempt from disease(R 1.16.9.1). Resplendent Agni, Thou art the protector of people in villages.(R 1.9.1.10) are seen showing the existence of villages and concern for the nourishment ,health and protection and well being of its inhabitants.

“Indra overturned 1000 stone-built cities”(R 4.3.9.20).Indra ,you are the blaster of fortresses(R 386.38).Indra demolished the ancient cities of Ashna(R 2 .2.9.5).Invincible,destroying the phallus worshippers he won by his prowess whatever wealth was amassed in the city with 100 gates(R 10.8.9.3).Thou hast destroyed the impregnable cities of the Dasyu Shambara(R 6.3.8.4). These passages show existence of cities.

The king was chosen by people.Because Rgveda mentions “Like people choosing their king”(R 10.10.12.18)Proceed like a king attended by his followers on his elephant(R 4.1.4.1).In a good Government of whose realms ,the opulent and the victorious Ikshwakus prospers,so that the five orders of people are happy as if they were in heaven (R 10.4.18.4).This shows a good governing system under which the panchajana were happy.May he bestow upon us a three-storeyed dwelling and fertility(R 7.6.12.2) shows the buildings were big and could contain big families.

Ships and voyages:-The sea was used for ordinary travel,transport, for trade and for warfare and the Vedic people were good navigators who knew the course and time of monsoon winds and the sea routes.Wealthy traders who traveled far and wide and exchanged goods earning wealth for the nation were existing.Boats for rivers and sea were different.Many-oared ships,cargo ships,and for sea fights were described.For a people to develop maritime trade and expertise in sea travel and sea battles considerable knowledge of several technical sciences is essential.The ship wrecks and losses in business and the risk taken even in face of it shows their courage ,expertise and spirit of entrepreneurship.

Men pass to several quarters of earth in a ship(R 10.4.14.7).Carry us like ship in a sea(R 1.15.4.8)As merchants covetous of gain crowd the oceans in vessels on a voyage((R 1.10.6.2).May we destroy enemy as waves wreck a ship in the sea(Y 135.9).We will get into a hundred oared ship which is beautiful to behold and

which has no leaks(Y 387.7).Varuna,knows the course of the ships(R 1.6.2.4).This exploit you achieved ,Aswins,in the ocean,where there is nothing to give support,nothing to rest upon,nothing to cling to,that you brought Bhujyu ,sailing in a 100 oared ship,to his father's house.(R 1.17.1.5).Thugra was a friend of Aswins.Enemies residing in a different island had a trouble.So Thugra's son Bhujyu was sent with an army on board ship.The vessel floundered in a gail.Bhujyu called out Aswins.They brought him and his troop back home.Carry us like a boat in the river(R 1.15.6.1).Like a boat that take passengers across a stream.(R 1.19.5.2).As a crowded boat goes quivering through the water(R 5.3.2).There are many more passages in the rgveda about sea travel and the way of the searoutes known to the winds,whales and migratory birds etc.

The weaver:-

Weaving carpets,fabrics for garments were of excellent quality. Wool from sheep was used.Pure herds were reared for maintaining good supply of good quality wool.Since stitched garments are mentioned use of needle was known.The best carpets were soft.Embroidering was done for beauty.Coarse fabrics were used for blankets,for garments of daily use and for the poor.Both cotton and woolen clothes were used depending on region and and the climate /seasons.The pure breeding habits for getting good wool is very important in animal husbandry.The occupation had reached a very high excellance from this evidence.

I seat you on a seat as soft as a woolen carpet(Y 11.8).Kusha grass set soft as a woolen carpet(Y 387.83).Lord of pure he-goat and she-goat ,weaver of clothes of wool of sheep(R10.2.10.6). Interweaving in concert like two famous female weavers,the extended threads to complete the web.(R 2.1.3.6). A contest(competition)arraged the weavers for excellance.

Bring us handsome garments,bring us cows,easily milked(R 9.6.1.50).I understand not,the threads of the warp,the threads of the woof,nor that cloth which they weave.(R 7.1.9.2) being a response to the mystery of life ,as it unfolds like a pattern in a loom .The riks are its warp threads,the yajus its woof(Ath 487.6).Cares consume me as a rat gnaws a weaver threads (R 1.15.12.8).

Entire creation is compared to weaving.”These,our progenitors, who have preceded us ,weave it,weaving forwards,weaving backwards,they worship Parajapathy when the world is woven.(R 10.11.2.1).You,Indra,have cut the angles of the sacrificial post with a needle.He has slain a lion by a goat.(R 7.2.1.17).Purified with a woolen filter(R 8.1.2.2).This refers to sieving.In sacrifices the sieve is a skin of ox .

The carpenter and the wheel:-

Fashioning and construction of wagons,carts,chariots,and toys with wheels,etc are known.The gifts include carts and chariots.Road transport was for war and trade as well as for pleasure trips and for festivals in temples.Fashioning of wheels ,fitting of tyres, construction of different sizes and shapes ,ornamental wheels and pillars with wheels and stony frame for axles were known.

Shipbuilding had achieved great standards .Deftness and skill of carpenter is praised in many hymns.(Ref.R 6.4.4.23-24; 8.9.5.23; 1.11.4.4; 3.1.2.1; 3.3.9.1;1.21.2.2.9;5.2.55.6.7; 1.7.4.9; 1.7.5.6; 1.22.8.13; 3.5.1.19.20;1.17.3.2;3.2.3.5 from Rgveda alone refers the carpenter.Y 135.5;117.8;175.3 are from Yajurveda)

The war chariots were very strong and fast moving on rough terrains and bearing heavy loads of weapons,armour, attendants ,etc.The skillful charioteer drove horses,wherever he Willed

,horses raising dust with hoofs,with loud neighs,retreating not from the charge,but trampling with forefoot upon enemies and trained specially for warfare.The quiver ,parent of the many arrows as parent of many sons,clang at the back of warrior,prolific of shafts (R6.14.5.6.7).The plough and other wooden articles of domestic use and housebuilding and temple building etc were also the carpenters pursuits.

Tanner and leather worker:-

Was an important craftsman.Scavenging of dead animals and killed animals was done by them.Hides and skins were used for various purposes.(apparel,cuirasses,aprons,waterskins as floats,leather bottles,holders for fluids,,for transport of water in caravens,shoes ,arm protectors,wards for archers ,thongs,reins, straps,harness,saddles,floor spreads,drums,etc.)Tanning was of high order.Leather was as soft as silk.Special treatment against damage by water spirits and fluids was done.Bellows used by blacksmiths,goldsmiths and musicians were made by tanner/ leather worker.Rgveda 8.1.5.38(cuirasses)and R8.1.1.17 (cowhide) and R 7.5.19.2 mentions such uses.Bellows(R 10.6.4.2)leather bottle in house of spirit vendor(R 1.24.12.10)sandals(Y 238.5)use in chariot(R 6.4.4.26)cattle trough and strap(R 10.9.2.5)wardrum(R 6.4.4.29-30)rein ,saddle,bridle(R 5.5.5.2)armguard for protection from bowstring(R 6.14.14)soma in cowhide(R 1.6.59) are some examples.If this was a very important activity ,why were the tanner/leather worker placed outside the city and considered untouchable and polluted?

1.The sense of cleanliness and aesthetics of the townplanners

2.The city should be free of bad odour and aesthetically nice to see and with remains of animal carcasses strewn in the middle of the city/village is not a good sight .

3.The dead ,whether animal or man is belonging to ancestral or pithru world and the remains have to be segregated from the living world immediately and disposed of away from the dwelling place and away from women and children

4.The eating of flesh and killing of animals was not considered a good practice and those who did such activities were segregated.

Metal workers:-

Gold was precious(R1.14.4.2)Decoration with ornaments was done(R1.11.7.4)Jewels and stones marked wealth(Y230.1).Golden earrings and necklaces mentioned(R1.18.2.14)Warriors wore lances and golden necklaces(R 8.3.8.11)and golden armour(R 4.5.8.2)Bridegroom adorned with jeweled gold(Y383.11)and soma in golden ladle(Y392.25)steeds with golden trappings(R 1.18.6.4) gift of 100 gold pieces and 100gold necklaces(Ath.79.1.7.8)gold coins,fabricated gold,silver and leaden articles(Y 257.4) iron, silver,gold(Y 25.4)Lead curing the diseases caused by wind or vaayu (Ath.16.3)sharpening intellect like the edge of an iron sword(R 6.4.4.10)sharp razor in the hands of a barber (R8.1.4.16) The bright edged hatchet ready for work(R 1.18.1.7)Pointed iron shares cleaving soil and pushing ploughed soil on both sides of furrow(Ath 88.1.7) shows the craftsmanship of metal workers as well as the lifestyle of people .

Traders:-

There were small scale and large scale traders.Take not advantage of us like a dealer ,says Rgveda(R 1.7.3.3).May both buying and selling be advantageous to us(Ath 8.6.4).We seek money by investing money.May the wealth so made by trade grow ever more(Ath 86.5).As merchants covetous of gain crowd the ocean in vessels in a voyage (R 1.10.6.2). This shows the trade ,commerce

and even the reason why trade was looked down upon than the agricultural pursuits .

The physician :-

Atharvan,Dhadhyach,Aswins were noted physicians and surgeons of fame.Blindness,leprosy,jaundice,disfigurements,fractures,illness of old age,baldness ,infertility ,surgical art,transplant,etc are mentioned(R1.17.2.24;1.17.2.7;1.17.2.18;)The Haridroga (jaundice)and Hridroga(heart disease)are said to be cured by sun (R 1.9.7.11)and this is done even now by modern medicine.The story of Chyavana getting back his youth and virility(R1.17.1.10)is famous and the medicine in his name is vit C from myrabilon. Different organs of body are described (Y 304-312)including viscera and the cutting of organs showing awareness of human anatomy and treatment of diseases of these organs.Cough,lung problems,chest affections and fever that recur in three days,once in two days,continuous on all days,(different types of malaria)fever of hot days,of rainy seasons,dewy season are described.(Ath 164)Premature birth,miscarriage ,foetus with no malformation(Ath 439)libertine impotent preparations(Ath 311) against goiter(Ath 198)jaundice(22)leprosy and skin disease(Ath 124)Tuberculosis of many kinds(Ath 168)baldness(Ath 309-310) are mentioned.Physician is considered the father of the patient since he gives a second life.(Ath 44.1).A host of herbal remedies were known and grown.

Potter:-

Potter's wheel,potters ware with a club(R 1.8.1.16)a mallet smashing earthen pots(R 7.6.15.21)crooked pitchers(R9.7.3.13) show the potter as an important artisan.

Barber:- As a barber cuts off the hair (R 1.14.8.4)and as he sharpens his instrument(R 8.1.4.16) are mentioned.A long list

of classes according to profession is given in Anuvaaka 396 of Yajurveda. It is the official list of professionals and not caste distinction. Brahmana, Raaajanya, Vaisya, Soodra, Kallar (which is still existent in Tamil country and their gene is studied and found as 60000-70000 years old), napumsaka, narthaka, nattuva, adulterer, people to beat drums, vainika, gambler, jaara, kanyaka, lover, nasthika, courtesan, clown, bald, hairy or Romasa (This name is given to one of the astronomical sidhantha of Varahamihira's panchasidhanthika and from the name modern historians think it is astronomy of Rome. But the name in Yajurveda suggests an Indian origin. The fact that there is a old cave in the name of sage Romasa /Lomasa in central India shows the antiquity of the name while Rome is only a very recent city.) the graamamukhya, the kanakka or mathematician, the musician, one who plays the conch, goldsmith, engravers, potter, chariotmaker, carpenter, bowstring maker, hunter, fishermen, dogkeeper, tanner, trader, iron smelter, watch men, ploughmen, elephantkeeper, shepherd, butchers, ropemakers, authors, investigators, physician, stargazer, war mongers, women making scented oils, barren females, twins (supposed to have healing powers), rogues with no job, and a host of others are mentioned.

Rgveda mentions a puppet show arranged on a slender stage (R 4.3.11.33) and sharpers and gamblers who cheated in play of dice (R 4.6.13.8) a harlot going to accustomed place (R 10.3.5.5) a libertine who caress a woman (R 4.3.11.16). These show a very complex and a very sophisticated society, a mixture of different types of professional skills, and good and bad habits among people but always respecting the good and slighting the bad habits, and it resembles our modern society. Both sinner and saint are listed here. Noble and mean, wealthy and poor, rogue and simpleton, expert artisans and producers and consumers who needed their produce – a well balanced economy.

The harappan civilization (Gregory Posshell 2nd revised ed pp 415) had two systems of weights.

1. The hexahedrons –cubical-chert weights of urban phase with ratio of 1:2:4:6:16:32:64. This was the Indus std seen in all Harappan towns including Lothal and Rangapura.
2. Another spheroidal weight system of agate, chert and dolerite in Lothal and Rangapura (where only dolerite and sandstone weights). The smallest weight of the hexahedron was 4.337 and the next was 8.5733 which was almost near a shekel of Babylon of 8.37. The truncated spheroids of Lothal had 98.2 gm, 156 gm, 229.5 gm, 271.2 gm, 275.2 gm, 280 gm, 300 gm. And 8.5733 was the standardization. Taking all the hexahedrons of the Harappan sites from $3/2$; 3; 6; 7; 1; 18; and 32 and multiplying each with this std number ratio of $1:3/2:3:6:12:18:32$ was obtained.

What I notice is that the 7th number is 32 in each system and thereafter the ratio is thus unified. The 8th is 64 which is 8×8 and is a square. In the first system there are 2 and 4 and 16 as squares before 64 but in the second system 64 is the first square number.

Page 236 of the same book reports the occurrence of two types of sling pellets found in Mohenjo Daro near the granary. One was round and spherical, the size of a marble and the other was more rare and ovoid and had 2.5" length and 1.6" dia. This type occurred at all levels of excavation. They were baked ones and similar pellets were discovered in Sumer, Turkestan and Indian sites. Sankalia questions the identification of these objects as ammunition by Marshall (Sankalia 1977:68-69).

Page 192 tells of excavations in Bhagaval pura in Kurukshetra district. (Late Harappan period). Two oval shaped structures one having 1.8 by 0.85 cm and another 1.6 by 0.92 cms was identified from there. In the third structural phase of construction the houses were constructed by baked bricks with sizes:-

1. 1.2 X 1.2 X 18 cms
2. 12 X 12 X 8 cms
3. 29 X 22/12 X $\frac{1}{2}$ cms (wedgeshaped)
4. 20 X 20 X 8 cms

5. 16 X 12 X 4 cms

Dr Bryan Wells have measured three ceramic glazed pots from Harappa with circumference of 193 cm and height 64 cms ; another with circumference of 269 cms and height 74 cms ; and the third with 262.5 circumference and height 85 cms .The volume of each was measured by him and it was 27.30 litres,55.56 litres and 65.89 liters respectively.Each of the pots had three,six and seven long strokes inscribed and he calculates the value of one long stroke as 9.24 or approximately 10.

That means a pot with three long strokes and circumference of 193 cms and height of 64 cms has a volume of approximately 30 liters (27.30 only since a jar is a truncated spheroid and not a perfect sphere.).

The one with 6 long strokes and a circumference of 269 and height 74 has a volume of 60 liters for a perfect sphere and since it is a truncated sphere only 55.56 liters.

The one with a circumference of 262.5 and height of 85 cms and with seven strokes has a volume of 70 litres as a perfect sphere and as a truncated sphere it has only 65.89 liter capacity.

Quoting B.B.Lal, H.J.Winter and S.Rao C.P.A .Vasudevan has given a series of weights from Indus valley and has introduced a problem with Rao's calculation.(page38-40 The nature of European expansion and the Indus Valley weights

.C.P.A.Vasudevan ed.Dr N Mahalingam .International society for investigation of Ancient civilizations .102.Mount Road ,Guindy ,Madras 600032)It is as follows:-

B.R.Lal:- The weights fall in the progression of 1, 2, $8/3$, 8, 16 ,32 upto 12800 .

H.J.Winter of Exeter uty :- In the ratio of 1:2:8/3:4:16:32:64:160:200:320:640.He says the ratios are based on an important number 16,in ancient Indian numerology (Shodasa).Certain others are obtained from it by doubling or

halving. The use of fractional thirds and development of a decimal form of higher numbers is also seen which is interesting.

1, 2, $\frac{8}{3}$, 8, 16, 32 and 64 do not form a regular line of progression. The $\frac{8}{3}$ stands outside the line formed by doubling or halving the numbers. Similarly 160, 200, 320, 640, and 12800 also fail to fall in a line. Some being productions of multiplications of ten (of the figures obtained by doubling). Others are multiplications of 100. Thus arranging them in 4 rows we have

1. The thirds				$\frac{8}{3}$			
2. Figures by doubling .	1	2	4	8	16	32	64
3. multiplied by 10					160	320	640
4. Multiplied by 100			200				12800

5. Now we have to fill in the gaps in each line. The complete series then is .

A. Thirds.	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{4}{3}$	$\frac{8}{3}$	.....
B. Primary sreni.	1	2	4	8	16
	64	1280			
C Dasaguna(X 10)	10	20	40	80	160
	640	1280			
D. Sathaguna (X 100)	100	200	400	800	1600
	6400	12800			

This actually goes on increasing to any number of powers of (10) upto parardham and above. As given in the Veda (Refer Raagachikitsa . Readworthy publications . Dr Suvarna Nalapat pp and DC Books)

The progression in two dimensions (Horizontal and vertical) is thus seen.

Horizontal by doubling repeated seven times

Vertical in three steps as division into thirds, multiplication by 10 and by 100.

You can draw this on a sign + which is the KA of Brahmi and the part of swasthika or sarvathobhadra in Indus lipi.

About Rao's observation and CP.A Vasudevan's problem about it :-

According to Rao the smallest Indus weight as a unit (From Lothal as 1.8233 gms) the ratio of 2 4 6 8 16 32 64 120 was found and the mean values of other groups were 3.488,5.172,6.896,13.792,27.584 ,55.168 and 137 gms respectively.

He says a second set of weights from Lothal is remarkable for regularity of ratio and the smallest of the series weighed 1.2184 gms and others stand in the ratio $7/2$, 7, 14 ,28 respectively weighing 4.33370,8.5753,18.1650 and 32.3052 gms .

Sri Vasudevan notes :-

1.The unit of 1.8233 gm on multiplication by the given factors will not give the products 3.448, 5.172 , 6.896 etc but if the smallest weight is 17.24 and the factors are 2 3 4 8 16 32 and 80 respectively these values are obtained.(In fact the wikipedia says the smallest weight of Hrappa was 17. 24 so that the ratio is correct).

In that case the resultant figures are accurate to third decimal place ,all but the last (137.90) which ought to be 137.920.

The second unit 1.2184 gm also will not give the figures 4.3370 and the series when multiplied by $7/2$. 7, 14 , 28 or any whole numbers .Thus he finds out something wrong in Rao's smallest weight and ratios observed from it.

If 3 ,6 120 etc were in use another series of progression was in use :-

1	3	6	12	24
10	30	60	120	240
100	300	600	1200	2400

As well as according to Rao's conclusion a fourth series :-

$\frac{1}{2}$ $\frac{7}{2}$

1 7 14 28 35 42 49 56 63 70

10 70 140 280 350 420 490 560 630 700

And this elaborate series of weights and measures and progressions which occurred in India at least from 3000 BC (even before that) is thus a computer type clue to the knowledge systems of all Indian arts ,sciences and philosophy and that is what I am trying to integrate .It is not just a language script alone but a script in which numbers and the whole knowledge system is given as a soothtra (short formula) for entire world and this they did since there was aprediction that the people and the palm leaf manuscripts and other things are about to be lost in a great deluge and they wanted it to preserve for the posterity so that someone some day will find it and decipher it for entire world.

Continuity of Vedic ,Harappan and Present day Indians

My calculation and conclusion:- I have proof to show that the present Indians (probably all people on the globe)is still following the same mathematics as the ancient Indians followed.Iwill start from the old pre-independent and the present system we follow (which are only two ways of expression of the Harappan system)

4pai=1 anna

16 anna=1Rupee This increase in 1, 2 , 5 ,10 ,20 50 , denominations to 100 Rs 100 and so on.

$\frac{1}{2}$ of a Rupee=0.50 =old 8 anna

$\frac{1}{4}$ of a Rupee=0.25 = 4 anna

$\frac{1}{8}^{\text{th}}$ of Rupee =0.125=2 anna

$1/16^{\text{th}}$ of Rupee=0.0625=1 anna=4pai

$1/2$ of an anna= 0.50=2 pai

$1/4$ of an anna =0.25=1 pai

$1/8^{\text{th}}$ of an anna= 0.125= $1/8^{\text{th}}$ Of 4 pai only .

$1/16^{\text{th}}$ of an anna is a pai.

Division of pai=

Half of $1/16$ as $1/32$

Half of that ,or $1/4$ of pai = $1/64$

$1/8^{\text{th}}$ of $1/16$ or a pai = $1/128$

$1/16^{\text{th}}$ of $1/16^{\text{th}}$ = $1/256$ and so on the value decrease at same rate on the opposite number of the expanding numbers .(Both +ve and ---ve numbers used in mathematics.

$1/4^{\text{th}}$ of 10 Rs =2.5 Rs

$1/2$ of 10 Rs =5

$3/4$ of 10 Rs= 7.5 Rs (a decimal which is a fraction 7 and a $1/2$)

Then come next as 100 .Rs (Taken as a whole 1)

$1/2$ of it =50 Rs

$1/4$ of it 25

$3/4^{\text{th}}$ of it =75 and it is not a fraction.So as numbers increase in numismatics fractions and negative numbers become whole numbers.

Then 1000 Rs .Same principle .Like this one can expand to 10 to the power of n numbers which is called the para .10 to the power of 13 is prardha so that of para is 27^{th} power and beyond.

$1/16$ for a people who use decimal is 0.0625

$1/32=0.03125$

$1/64=0.0156440625$

$1/128=0.0078203046875$

So $1/128$ has a 13 digit decimal just like 10 to the power of 13 or parardha .

From here either you can add 12800 like that or as a number to the power of n to change the position.There is only position change in decimal system.This is what the IVC Harappan weights indicate.

They knew all the problems with which the European

mathematicians had been toiling with from BC 500 to 16th century (both periods being their contact periods with India.

Now about the problems of the three fractions which we saw earlier

1. The $\frac{3}{2}$ fraction used in std hexagon ratios of Harappa
2. The $\frac{8}{3}$ used in series 1 2 $\frac{8}{3}$.4 8, 16 ,32 ,64 100 .,200 etc in B.R.Lal series
3. The $\frac{7}{2}$ fraction as C.P.AVasudevan pointed out in Rao's series.

$\frac{3}{2}$ is 1.5 so that the std hexagon ratio is used as

1:1.5:3:6:12:18:32

$\frac{8}{3}$ is 2.26666...a recurrent decimal.

So the series can be rewritten as 1 2 2.66 4 8 16 32 64 100 200 and so on.

$\frac{7}{2}$ is 3.5 .

So the entire series including the fractions become :-

1: 1.5: 2: 2.66: 3.5 4 8 16 32 64 128 and their multiplications by 100

Thus one fraction is between 1 and 2 and two fractions are between 2 and 4 .

It introduce the remaining numbers 3 , 7 and 9 as well as 11 into the series.

$\frac{1}{3}$ is 0.3333333..recurring decimal $\frac{1}{7}$ is 0.142857,

142857,142857 ...recurring decimal used by

Paithamahasidhantha.

$\frac{1}{9}$ is 0.1111111...a recurrent decimal.

Using $\frac{8}{3}$ the number 3 and its multiples are included into the series of 2 4 8 16...

7 is to be included along with the next number 11.(the next to 10). $1 \times 7 = 7$.

$11 \times 7 = 77$

$\frac{7}{1} = 7$

$1/7$ =The recurrent decimal mentioned above which is the astronomical value .

$$11 \times 2 = 22$$

223 71 (220+3 and 70+1) contain 294 which include all numbers upto 11 .

223/71 is thus described as a paridhi and its fractional value obtained.

The value of $22/7$ is fixed thus as the value of pai. The pai is the pazhaya kaasu (karshaapanam) as well as the bag in which it is contained or the limit of a purse that can be filled with it (the volume). This is also the same measure of the Kudam or ghatam . Those who measure volume by pai, and by kudam or any vessel use same formula used by astronomers to measure zodiac and stars and by vaasthu people to measure geometry (jyamithy) . Thus algebra and geometry and weight and measures of the various objects from grains to gold was standardized in the same way which shows the accuracy of the scientific mind of Harappans. They experimented with kunni9Abrus precatorious seeds, cowrie , grains and liquids and found out the volume of each urn and pot and object they make and the ships and boats they make before they started their trade. So if we are able to see the objects and weights and measures they made from 7000- 8000 BC from Mehrgarh period , they must have started the process of scientific thought several millennia before that.

But more remarkable is that they standardized their music also on the same scales. The paramaavadhi (the ultimate limit concept of the human intellect , as well as that of the universe reached the ParaBrahman concept and the expansion has to be followed by a contraction as in a + and --ve flow of electromagnetic field and this they expressed as their mathematics and astronomy.

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Now go back to historical times and to chapter on the measurements of Koutilya for the gold, for the thulakol, for samavrithathulaakkol, and also for the dronam which is an urn with a truncated spheroidal shape. The system of volumetric analysis that was followed from Indus valley /Harappan to historical ChandragupthaMourya period was the same and continuous will be cognizable. For construction of a equal vritha(samavritha) thula (balance) he uses a 72" or 3 muzham kol length and takes 70 as 9 palam. (72 then is approximately 9.24 to 9.33 or $9 \frac{1}{3}$ palam).

6"=1 palam

3"=1/2 palam 0.5

2"=1/3 palam 0.33 a recurrent decimal

1 1/2 " =1/4 palam 0.25

3/4 " =1/8 palam 0.125

To make it 10×7 divided by 2 =35 palam iron needed. Or roughly $9.33 \times 9.33 = 87.0389$ which if the difference from the 8573 as 85.73 dasamsa is calculated will be 1.20 only. Thus the calculation is a decimal way of doing it .

What Koutilya says about the volume of such Dronam has to be then carefully reexamined.

He describes four types of volumetric measures for Dronam.

1. Aayamaanam contains 200 palam grains. A quarter of it ($1/4^{\text{th}}$) with 50 palam is called a Aadakam and $1/2$ of an aayamaanam is a Prastham with 100 palam grains. $1/4^{\text{th}}$ of a prastham is a Naazhi or naazhika containing 25 palam and is also called a Kudavam (kudam/ghatam) or a Kudumba.

That is measuring the jars as cylinders (Para or Parstham has a cylindrical shape) and as truncated spheroids (Kudavam).

2.The same when we apply to a Vyavaharika Dronam which contain $187\frac{1}{2}$ palam grains .47 palam for a $\frac{1}{4}$ of it, 93 for a $\frac{1}{2}$ and 23 to 24 for $1\frac{1}{4}$ of a quarter .

3.For a Bhaajaneeyam which contains 175 palam grains the same values in order will be $43\frac{3}{4}$; 87.5;and 22

(The 87.5 is comparable with the value we get for a squaring of 9.33 as 87.0389. as shown above).This calculation is for measuring of grains for workers as Koutalya says.

4.The drona called Anthapura in the same way contain 162 palam of grains and the ratios will be as follows .40-41; $81\frac{1}{4}$; 20-21 .

Another interesting point about the construction of a balance kol is the difference in its length (as 8) needing 1 palam increase in the amount of iron needed

6 ‘ length =1 palam

14’= 2

22’= 3

30’’= 4

38’= 5

46’= 6

54’= 7

62’= 8

70’= 9

78’= 10

72 ‘ being a samavritha balance it is 9 palam + $\frac{1}{3}$ rd of 6”length and that is how the approximate value was reached.

Volume of a Naalika /naazhikavatta(a pipe or a cylinder is a nazhi and a vritha is a part of a sphere) and measuring time by it by looking at floatation and sinking by volumetry:-

The two methods of measuring time during day and night by chayamaanam using a sankuchaya or Purushamaanam and by using the floatation and sinking technic of volumetric analysis were present in India .In Bhagavatham Vyasa has described how to construct a naazhikavatta and in Arthasasthra Koutilya has described its construction and in the 4th-5th century AD

Varahamihira has described its construction. So that is a continuous tradition in India .It existed till my grandmother’s time (and I have a old Nazhikavatta with me which belonged to her and her mother).84 “is a vyamam or maaru (when a man holds his arms spread) and with this the rajjumanam(for measuring with rajju or a coir /thread)and khathapourushamaanam(for measuring a depth of a mine)is measured. The Garhapathyadandam or kol for grihastha fire is 4 arakhni or 96 “

A dhanus is 108” for a path and wall etc.

A pourushamaanam or Agnichayas is 96” =8 chaya (when 1/ 18th of the day is over.)

6 kambam is a Brahmadeyam or an Athithisathram.

10 dandam is one Rajju

That is 1920”

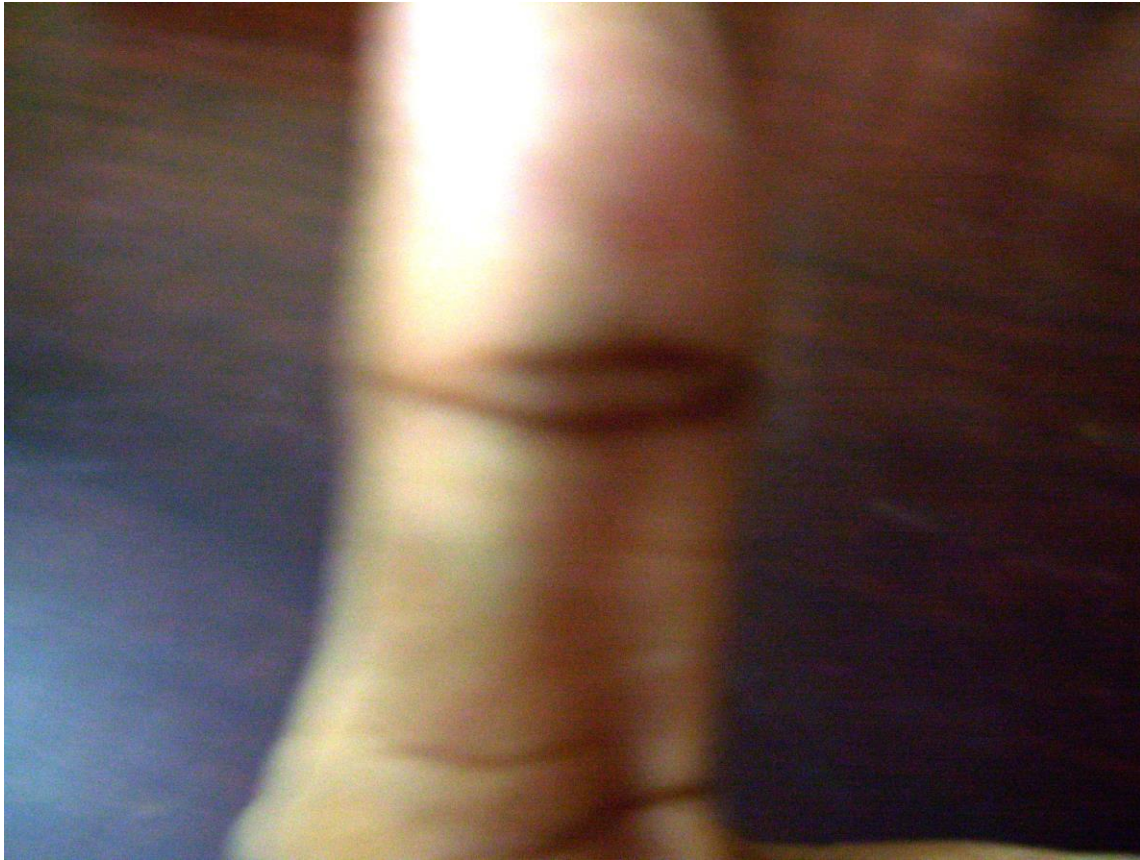
2 rajju= 1 paridesam

3 rajju=1 nivarthanam

42 finger =36”

Therefore 84 viral or finger = 72 “

*(See picture of a thumb or viral with a Navaranellida or size of a paddy seed in the middle)



So how much will be 84 inches?

$84 \times 84 / 72 = 7126 / 72 = 0.9$ and $646 / 648$ almost 10

That 84 “was thus taken as a maaru or a mans outstretched arms on either side (the diameter)and his height as the vertical to that horizontal line making a golam or sphere corresponding to the cosmic sphere .

Chaya 8 pourushamanam = 96” or $1/18^{\text{th}}$ of day over

6 pourushamaanam chaya =72”= $1/14^{\text{th}}$ of day over

4 pourushamaanam =48”= $1/8^{\text{th}}$ part over

2 pourushamaaanm = 24'' = 1/6th part over

1 pourushamaaanm = 1'' = 1/4th over

8''chaya means 3/10 part over.

4'' = 3/8th over

0 '' = noon

(That is from 8 pourushamaana the 8th is the 0 where no shadow is there.) Now this is in reverse order for the rest of day till sunset.

At night it is better to use the nazhikavatta since no sunlight and shadow seen especially for seafarers.

1/4 nimisham = 1 trudi

2 thrudi = 1 lavam

2 lavam = 1 nimesham

5 nimesham = 1 kashta

30 kashta = 1 kala

40 kala = 1 nazhika

Thus time and space have been unified by a naazhika.

Take 4 maasham gold and with it make a 4'' needle (salaaka) and with it make a even opening on the base of a ardhakunda (hemispherical thin pot) made of Thamram. Then put the pot in a bigger vessel with water. The water will enter through the small opening drop by drop. And when the pot sinks by the water one is measuring the volume it contains and the time taken for its sinking as a nazhika and the problem of volume of a cylinder and a sphere is solved. This was the secret which Archimedes heard and tried to figure out and finally did figure out. But the water clock of Greek and this water clock of Indians are not the same. the water clock of

Greeks though used the floatation principle was not measuring the volume of water needed to sink a vessel of a particular capacity and the time needed for it.

2 naazhika =1 muhoortahm

15 muhurtham= I day or 1 night (for months of Chaithram and Aswayujam as samarathra or Vishuvam)

Then every 3 muhurtha decrease and increase and day and night length increase or decrease as it is towards aphelion or perihelion .

Thus Indian volumetry extended to comparison of volume of a vessel,a ship,of a sphere and cylinder and to cosmos and human body as a Gola /naalika combination with vertical and horizontal measures .The spheres of celestial bodies,of human body and of vessels were done with same precision and measurement and at a scale difference only.This was applied not only to geography, astrophysics and aesthetics and mundane measurements of vasthu and vessels but also to music in the same manner .Thus the mathematics itself shows the originality of Indian scientists and the secret of Indian history is in this .Those who just repeat that India received science from Greece and from Rome and from 16th century Europe has to do some more homework and correct their views from such solid evidences.

COMPARISON OF HARAPPAN WEIGHTS IN GRAMS WITH NO OF KUNNI (GUNJA SEEDS) AND SOUTH INDIAN NAMES

Harappan wts gms	Binary unit	Decimal unit	Average of the 21 wts per	No of kunni seed	Binary and decimal	Tamil/southern names

			unit			
0.571	1	.87	.87	8		2 panam ida
1.770	2		.89	16		4 panam ida
2.285		2.5	.86		20	1 kazhanju
3.434	4		.86	32		1 varaku nellida
4.337		5	.87		40	2 kazhanju
6.829	8		.85	64		2 varakunellida
8.575		10	.86		80	1 kaasu/karshapan am
13.731	16		.86	128		4 varakanellida
18.165		20	.91		160	2 kaasu
27.405	32		.86	256		8 varakanellida
33.05		40	.83		320	1 palam
54.359	64		.85	512		16 varakanellida
136.02		160	.85		1280	4 palam
174.5		200	.87		1600	5 palam
271.33		320	.85		2560	1 ser/cher
546.7		640	.85		5120	2 ser/cher
1417.5		1600	.86		12800	1 veesam
2781.4		3200	.84		25600	1 thada
5556		6400	.87		51200	2 thada

6603		8000	.83		64000	1 thulam
10875		12800	.85		10240 0	1 madanku
Total 28456		Total 33525	.85			

Conversion of kunni(gunja)weights to fractions and their breakups

Fractions	Names of fractions	Binary/decimal as in previous table of Kunnimani	Break up of fraction
1/8	arakkaal	8	$\frac{1}{2} \times \frac{1}{4}$
1/16	Veesam/makaaaani	16	
1/20	Oru Maa	20	
1/32	Ara veesam	32	$\frac{1}{2} \times \frac{1}{16}$
1/40	Ara maa	40	
1/64	kal veesam	64	
1/80	kaani	80	
1/128	Araikkal veesam	128	$\frac{1}{2} \times \frac{1}{4} \times \frac{1}{16}$
1/160	araikaani	160	$\frac{1}{2} \times \frac{1}{80}$
1/256	Munthriye keel kaal	256	$\frac{1}{320} + \frac{1}{320} \times \frac{1}{4}$

1/320	Munthry	320	
1/512	Keel aria arakkal	512	1/320 X 5/8
1/1280	Keel kaal	1280	1/320 X 1/4
1/1600	Keel nanma	1600	1/320 X 4/20
1/2560	Keel kaal nama	2560	1/320 X ¼ X 4/20
1/5120	Keel veesam	5120	1/320 X 1/16
1/12800	Keel aria maa	12800	1/320X 1/40
1/25600	Keel kaani	25600	1/320 X 1/80
1/51200	Keel araikkani	51200	1/320 X 1/160
1/64000	Keel nanma ara maa	64000	1/320 X 4/20 X 1/40
1/102400	Keel munthri	102400	1/320 X 1/320

Note the sandwiching of binary and decimal system and making sreni or series with it and measuring everything by such simplified ways which existed in BC 3500 and to till date as a continuous tradition and now we have to compare these mathematical genius of ancestors with our modern mathematical science of the west .Therefore the history of western mathematics from BC 500 given in a nutshell.

(comparison of two sizes of Kunnimani with manjadi, and seed of Ilanji and ricegrains.Note the shapes ,size length,bredth differ and the number of these filled in the same jar will be different).



The concept of Mathematical discoveries of Europe at present accepted by modern science:-

1. Measurement of a sphere Archimedes 287-212 BC
2. Fraction of Egypt exist from 1650 BC scroll of ancient Egypt but it was a clumsy aliquot fraction and if $\frac{2}{5}$ is to be written they had to write for the second fraction $\frac{1}{6} + \frac{1}{30}$ (not $\frac{1}{5} + \frac{1}{5}$).

$$\frac{2}{5} = \frac{1}{5} + \frac{1}{6} + \frac{1}{30}$$

Babylonians followed system of whole numbers each unit divided to 60 parts called the second minute parts and this continue with 3rd and 4th minute parts. This was used to tell time, and is used still. Hour into 60 mts, minute into 60 sec like that. The second is then

divided to fractions of decimals rather than 3rds and 4ths.60 has many divisors and many fractions terminate in it.

$\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{6}$ $\frac{1}{7}$ $\frac{1}{8}$ $\frac{1}{9}$.

Of these $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{8}$ has a terminating destination.

$\frac{1}{3}$, $\frac{1}{6}$, $\frac{1}{7}$ $\frac{1}{9}$ has recurring representation. $\frac{1}{3} = 0.333333.....ad\ infinitum$

Using 6 ,60,600 etc the only fraction that has no terminating representation is $\frac{1}{7}$.

(In India $\frac{5}{8}$ is written as 0.625 . And $\frac{8}{3} = 2.6666666666.....$ and tabulation of whole number 2 as acomplete revolution and taking 6 as aconvenient number for time calculation is easy. Please do see the chapter on weights and measures of Harappan and IVC in 3500 BC -7000 BC)

3.Quadratic equation includes square of the unknown.Quadratus is latin word for square which is a Chathurbhuja in Sanskrit . Chathura in Indian regional languages.Babylonian clay tablet show the following statement followed by a question..”The area of a square added to side of square comes to 0.75.What is the side of the square ?”

How this is worked out in an Indian context I will write here.

Area (Called Kshethraphala) + side of square (called Mukham or face) =0.75

Expressed as formula $Ksa + Mu = 0.75$

If Mukham is one ,

Half of it will be 0.5

Multiply that half with itself to get a square it will be $0.5 \times 0.5 = 0.25$

Then if you add this square 0.25 of the mukham with the already known 0.75 you get mukham as 1 (in modern terms the coefficient of X^2). This 1 is the square of 1.

Subtract the 0.5 which you multiplied. Then 0.5 is the side of the square.

Or it is a way of finding the square root and also to find the faces of a structure with several sides. Both Babylonians and Indians knew this.

4. The construction of a pyramid with top cut off was known to Egypt and to American people.

A solid like a cone is a pyramid. It has slopes uniformly from base to a point at top in Egyptian pyramid. If a piece is cut at top that is a frustrum. 1850 Moscow papyrus shows Egyptians knew this though their pyramids were not having frustrum. It says, If a truncated pyramid of height 6 and square base of side 4 on base and 2 at top, square the 4 and get 16; multiply the 4 and 2 and you get 8; square the 2 and result is 4.

Now add the 16, the 8 and the 4 and you get 28.

Take $\frac{1}{3}$ of 6 we get 2. Multiply 28 and 2 and we get 56.

This gives formula of volume as:-

$$\frac{1}{3} \times 6 (4^2 + 2 \times 4 + 2^2) = 56$$

If we take height as h square top of side r and square base of side R the formula for volume is

$$\frac{1}{3} h (R^2 + Rr + r^2)$$

(Diagram of a Truncated pyramid)

(Now see the BC 3500- 7000 old Harappan / IVC measures of weights and its shape as both cubes and spheroids before you

proceed and compare the numbers used).Because we are now passing on to the circumference of a sphere .

5.Value of Pai and the ratio of circumference of a circle to its diameter.

Now considered as a discovery of Archimedes in 3rd century BC .Though both Indians and Egyptians knew it.The Pai is now considered as derived from the Greek letter P pronounced Pie.(Actually from Paridhi a Sanskrit word which is written as Pa by Mathematicians and the letter in old Brahmi and in Sanskrit is similar to the symbol that we use even now.).

Early Egyptian value was $4 \times (8/9)^2 = 3.16$ close to 3.14.

Bible 1 kings 7 verse 23 gives an approximate value.

Archimedes drew several polygons inside and outside circles with more and more sides and was able to close in on value of pie. With polygon of 96 sides the pai is between $223/71$ and $22/7$. Zu Chongzhi in 5th century used more accurate $355/113$. Madhava by trigonometry demonstrated a series or sreni for it which continues forever as :-

$\pi/4 = 1 - 1/3 + 1/5 - 1/7 + \dots$. By this he calculated pai to 11 decimal place.

With computers in 1949 ENIAC calculated to 2037 decimal place taking 70 hrs to do it. Modern computers upto a million decimal place is calculated. Pai occurs both in pure and applied mathematics .

(In India this was used for musical circles as well which will be seen and described from the weights of the Harappan and IVC periods and the musical scales and mela followed even today in the southern Parts of the country and how this is derived and applied to saama veda of Jaimini and Kouthuma traditions.)

The quadrature of the parabola or the area evaluation between a curve and a chord (which is a Danush or a bow and a chaapa/Jya in Jyamithy -from which term geometry originated in Europe - in Indian languages and seen frequently in Harappan IVC script with sign of a bow)was attributed to Archimedes of 287-212 BC.He found a method to add infinitely many numbers.A parabola is a conic . A classic example is a human female breast.If a straight line is drawn crossing it near its tip ,the shaded area between that line and the curve is the area between the curve and a chord (The chaapa/Dhanus) but it is more like a nipple on the breast with one triangle in the area leaving two gaps on either side .One has to draw two small triangles in the 2 gaps then there are 4 gaps left This will repeat indefinitely .The area of all these small triangles approach the area required.Thus by a method of exhaustion one has to find the area (Like the milk of the breast measured by its enjoyment by a child).An infinite succession of triangles exhaust the area between the curve and line like the infinite succession of generations exhaust the nourishing food of the earth mother as a Kaamadhenu.)

Greeks distrusted infinite process.(Zenos paradox).Archimedes proved that it is possible to add infinitely many terms and obtain something finite.He showed that this sum of infinitely many fractions : $1/1 + 1/4 + 1/16 + 1/64 + 1/256 + \dots$ has a finite value $4/3$.The children are taught that this is the first recorded example of a summation of an infinite series,a key part of mathematics .But that is not true as we see from evidence of Harappa and IVC civilizations which are several millennia before Archimedes.

Another question and answer credited to him is the sandreckoner .How to estimate the size and volume of universe and size and volume and number of grains of sand needed to fill that universe ?How many grains of sand will fill the universe and what is thus the volume of universe/This was the question given to Archimedes .Archimedes called numbers upto 10 to the power of 8 as first

order numbers. From that starting point he took successive multiples of this new unit. That is 10 to the power of 16 is the second order. This continued upto a myriad myriadth order which starts at 10 to the power of eight, the whole to the power of 10 to the power of eight. This was known to ancient Harappans who found volume of grains to be put in vessels and how the volumes of celestial objects and stars fit into the spacetime infinitely in same way but on astronomical proportions and the Veda starts the parardha or 10 to power of 13 in dasamsa.

6.6th century BC Greece and Southern Italy had the Pythagoreans who thought everything is number. They discovered earth is a sphere, earth is not the center of universe, musical harmony depends on ratio of numbers (But was it actually they who discovered it or the Indus valley/Harappan people is what I am trying to prove). The European scientists say that no one is able to decipher the saying of Pythagoreans that everything is numbers. They probably meant all could be explained through a number language or code of numbers and that the seen world is only an illusion and the unseen world of numbers and laws of nature is the real world (as conjectured by modern scientists). The important fact I find about Pythagoreans is that they had learnt that the area of land (Geographical measurement) and of weights of corn can be extended to a very abstract subject. But who taught them that? That is what I am speaking about when I speak of the global history of Mathematics. Who knew that everything on known objects, measurable objects could be extended to unmanifested abstract as well on an astronomical scale and who practiced this philosophy except the Harappans /IVC people and their wide trade and commerce agents? And how the Harappan series of weights and measures were taught to the Greeks and Romans through these merchant class people (The phoenicians) in BC 500?

The Pythagoras theorem of a rightangle triangle that its square on hypotenuse is equal to sum of the squares on other two sides was

known to Babylonians from BC 2000 and to Harappans from BC 6000-7000.

7 Pythagoreans were taught only part of mathematics ,not the whole.Because they thought everything can be explained in terms of whole numbers and their ratios.(Fractions).But this was not true. Because square root of 2 is not a ratio of two whole numbers but an irrational numbers (Akarani in Sanskrit).This is called proof by contradiction (Which in Indian terms is called Nethi ,Nethi .It is not this,not this .An exclusion principle).You first assume that square root of 2 is a rational number and attempt to prove it and get a contradiction as proof saying that it is not a rational number but is irrational.(Karani means that which can be measured and akarani is that which is not possible to achieve).When this was taught to the Pythagoreans (whoever was that unfortunate teacher)they thought he was impudent and in their wrath drowned him in the Aegean sea. So by 5th century the Indian /Phoenicians had become cautious of teaching others certain secrets or ideas ,we can assume.(They found that these new people are different from Babylonians and Egyptians and Americans who accepted teachers and their knowledge for betterment of society).

I will explain a little bit more of what the unknown teacher was trying to teach the Pythagoreans and lost his life for it.The greeks problems of doubling the cube,trisecting an angle,sqaring a circle involve constructions using a straight edge and compasses.What lengths are constructed by these instruments?There are essentially five operations .One can join two points with the straight edge. Draw a circle with a given center through a given point.Find the intersection of two straight lines.Can find intersection of a line and circle.Can find intersection of two circles.All these operations were known to Harappans from the evidence of their symbols and weights and measure series. If a problem involves a length which cannot be built up from 1 by + ,---, $\sqrt{\div}$ and X ,then it cannot be constructed. Doubling cube with exactly twice the volume of given

cube, and trisecting certain angles with these instruments alone is impossible according to Pierre Wantzel (1814-1848). The Harappans were trisecting an angle of 90 degrees to three angles of 30. Suppose we want to construct an angle of 10 degree we are trisecting a 30 degree. Then we have to construct a length of $\sin 10$ degree. This number is a solution of a cubic equation that cannot be broken to simpler equations. The numbers that are not algebraic are the transcendental number. Both $\sqrt{2}$ and π are transcendental. The Pythagorean Greeks could not accept an akarani or a transcendental number.

8 What is a perfect number?

A number is perfect if it equals the sum of its proper divisors. In 6th century AD St Augustine thought perfect numbers are mystically superior to others. He wrote:- 6 is a perfect number. God created world in 6 days. Because six is perfect. 6 and 28 are the first two perfect numbers. Divisors of 6 are 1, 2 and 3.

$$6 = 1 + 2 + 3$$

Divisors of 28 are 1, 2, 4, 7 and 14

$$28 = 1 + 2 + 4 + 7 + 14$$

The next perfect numbers are 496 and 8128 and upto this was known to 13th century Arabs. The next 3 with a set of three incorrect numbers were added by the Arab Ibn Fallus. The even perfect numbers are easily found with formula of Euclid. to the power of $n-1$ (2 to the power of $1-1$) provided the term inside bracket is a prime number. Upto 10 to the power of 300 (1 followed by three hundred zeroes). During vedic period upto parardham (13 zeroes after 1) was thus studied.

There is no odd perfect number. If at all a odd perfect number exists it should have at least nine prime factors. (Therefore to make a perfect solar system and a perfect understanding of it

sitting on the earth as a central point of the observer who makes his observations , nine graham or nine prime factors are needed. The Indians thus added sun,moon ,and the two nodes (or $1/2$ s of earths orbits) ,to Mercury,Mars,Jupiter,venus and Saturn)

9.A regular polygon has equal angles and equal sides.examples are equilateral triangles with 60 degree angles,the square or a samachathura,all angles being 90 degree,then a pentagon,hexagon and so on.Construction of these is possible with only 2 instruments -a straight edge and compasses.This is part of school mathematics only.This was known to Pythagoreans (taught by someone to them).Octagon or a Ashtadalapadma was known to Harappans/IVC and to Moscow Papyrus period Egyptians (much later than Harappans).Heptagons and Nonagons(with 7 sides and 9 sides)is that which is measured with 7 days,7 swaras ,nine graham and 9 rasa in musical aesthetics and in astronomy.That is more higher grade mathematics which was not taught to Pythagoreans by their teachers ,probably because they had killed him before that.That is why Archemedes had to wait for more centuries to acquire a knowledge of it.What we call Platonic solids are the regular polygons.

Tetrahedron has four triangular faces.Octahedron has eight triangular faces.Cube has 6 square faces.Dodecahedron has 12 pentagonal faces.Icosahedron has 20 triangular faces.The golden ratio and the golden law of the Phoenicians or the Phaneesa(king of the Phani) was taught to Pythagoreans by their teacher Phoenician and it is written with symbol that resembles a Naamam on the forehead of south Indians as the hood of a serpent with a U and a central line dipping in (The letter Zha in Malayalam is pronounced as in pazhaya,pazham signifying an ancient race of fame)And its value is 1.618.This is a pentagon,pentagram,fivepointed star,Penrose tilling and the ratio of successive terms of Fibonacci series ,and several natural patterns have this golden rule .The musical aesthetics is also by

this .This was known to Harappan and IVC people in 5000 BC but in Europe only in 1707-1783 by Euler this was identified .The rule of connecting vertice,face and edge of a solid is shown in table below where v is vertex,f is face and e is edge

Solid	V	F	E
Tetrahedron	4	4	6
Cube	8	6	12
Octahedron	6	8	12
Dodecahedron	20	12	30
Icosahedron	12	20	30

This law is not true for the two Kepler solids and for solid with a hole.

Note that cube and octahedron has same edge 12 ,and their values of vertex and edges are reversed and the same is true for dodecahedron and icosahedron.

Doubling a cube to get volume of the altar of Apollo was not possible for the Greeks.

The problem they faced was;-Suppose wach side of altar is k units .Then volume is $k \times k \times k = k^3$.If it is doubled then $k^3 = 2$

Therefore k must be $\sqrt[3]{2}$.The cube root of 2.

10.Apart from problem of doubling cubes the Greeks had two other problems which they could not prove for centuries.One was trisecting the angle and the other to construct a square of equal area to a circle.

The squaring the circle ,one has to construct a line of length π ,given a line of length 1.This is to be done with just a straight edge and compasses.

The area of square and circle has to be equal.suppose the radius is 1 unit.Area is $\pi \times 1$ to the power of 2.If equivalent square has side X units the area is X to the power of 2.Then find a length such that X to the power of 2 = π .The length was not the problem but the π was.To draw a line of π ,one had to use moving parts,or curves that could not be drawn exactly such as spirals.It took 2000 years for Europe all the three problems of the Greeks,their ancestors.But the Harappans had proved them several millennia before the Greeks.

The Zeno's paradox of 490-430 BC of the dichotomy of the tortoise and Achilles is an example.By the time Achilles run 10 paces tortoise is one pace ahead and the field that they have to cross was peculiar.Before one reach other side you have to get halfway across.Before one reach halfway you must get quarter point and travel an infinite number of smaller distances so that it becomes impossible to get across at all .

This cut the infinite space to infinitely many numbers to have a finite sum.What Archimedes showed with it became important part of Western mathematics only in 17th century .But this was known to Harappans and it was one such person who taught this possible and impossible and was killed by the hasty disciples.Because the dichotomy in Zeno's paradox is

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \dots = 1$$

(Refer to Indus valley weights)

Achilles and tortoise (Rather feet and tortoise or korma)or rabbit and tortoise story of India :-

$$100 + 10 + 1 + \frac{1}{10} + \frac{1}{100} + \dots = 111 \frac{1}{9}$$

Which means after running 111 and $1/9$ paces there is a possibility to catch up with the tortoise .The Chandra as a fast runner and the stars as a slow runner in the chandrasidhantha of Indian astronomers is this. See the dasamsa divisions and calculation of Harappan and IVC people again and you can see that they knew their sreni of weights of the finite types was actually to measure the infinite .It is possible to accomplish infinitely many tasks in a finite period of time .But it is also proving that any notion of movement or saayana universe and prakrithy as many objects is an illusion and that to know the immeasurable was impossible.And whatever there is measurable is expressed by their system of weights and measures and the numbers was known to Harappans as prakrithy ,time and that beyond prakrithy and measureable timespace as Brahman.

In mathematics as Plato correctly said there is only discovery and no invention.You can invent only technology ,not truth as an abstract principle.That is why he said “In mathematics men think the thoughts of Gods”.In more precise words mathematics in its abstract idea and thought is an absolute truth which is used by lesser individuals for mundane purposes.

11.The light cone of Einstein is now known to all scientists.It was drawn as a musical instrument of Shiva in India. It is a double cone cut by a plane.When the plane is horizontal it is a circle.When slightly tilted it is a ellipse.The plane parallel to the side of cone is a parabola,and when plane is steeply tilted it is a hyperbola.

If we want to define a cone without involving a threedimensional cone,on a piece of paper :-Suppose a point or bindu(Nadabindu or F) that is fixed and a line (Rekha d that is fixed) and a variable bindu moves so that the ratio is $XF:Xd$ is a constant.Then the X is moving in a conic.This ratio is called eccentricity and the fixed point is the focus or focal point .It is with this knowledge one can understand that the orbit of earth is an ellipse with the sun as a focus.This was not accepted by the Greeks as all of us know .But

Indians knew this .They knew the eccentricity as $1/90^{\text{th}}$ as we see from their astronomical calculatons from vedic times and from Indus valley and Harappan evidence.Since a wheel seen in an angle is an ellipse they thought of the Discus or chakra of Vishnu and Kaalachakra (Time of wheel)like this .If it is thrown in air it cuts a parabola as its path .This trajectory they saw as the reflecting surface of sunlight from the parabola.For long range navigation systems to guide ships the intersecting hyperbolas has to be used.So being the seafarers who traveled across the world the Phoenicians or kings of the Phani or naaga kings of India had employed this light cones and its tilts and the evidence of it is there in Harappan sites.

12.Fifth postulate of Euclid.

Gives properties of parallel lines. It states : That,if a straight line falling on two straight lines make the interior angles on the same side less than two right angles ,the two straight lines,if produced indefinitely ,meet on that side on which are the angles less than the two right angles.

This is needed to prove the proposition 29 which prove wellknown results about alternate and corresponding angles and also for proving Pythagorus theorem and many other standard results of geometry.

But there is a alternative possibility.The sum of angles could be less than 180 or greater than 180 unlike the pair of alternate angles with sum as 180 degrees.

The fundamental theorem of Arithmetic is that every whole number is written as a product of prime numbers .It is possible to factorize any whole number until one is left with prime numbers which by definition cannot be factorised any further.For one number there is only one possible factorization.

$$12= 2 \times 2 \times 3$$

$$35=5 \times 7$$

$$1001=7 \times 11 \times 13$$

The analogy with chemistry ,prime numbers are like atomic particles and cannot be split up and every other number can be expressed in terms of them.

The number of prime numbers are always infinite. There will be always a +1 after the last number we discover.

13 Hipparchus (190-120 BC) is credited with Trigonometry by western mathematicians and every one know that it is not true from the ancient archeological sites all over the world.Trigonometry taught in high schools is based on three functions ,the sine,cosine and a tangent and the original trigonometric function was the chord function.If the equal sides of a triangle have length of 1 unit,then the chord function theta gives the third side of triangle .The chord and sine functions are converted with doubling and halving .

$$\text{Chord } \phi = 2 \sin(1/2 \phi)$$

$$\sin \phi = 1/2 \text{ chord } (2 \phi)$$

The oldest surviving table of sine and cosine is seen in Almagest of Ptolemy ,a work of astronomy which he learned from India (After Alexanders journey to India).The table is numerically starting with results like chord 60 degree =1 chord 90 degrees = $\sqrt{2}$

And uses formulae for chord (A+B) and Chord A-B)and chords of angles are found for every $\frac{1}{2}$ degree to an accuracy of upto 6 decimal places.This familiar method of sine ,cosine and tangent introduced by Indian mathematicians and navigators are even now used and methods are the same but name of Hipparchus and Ptolemy is attached to the discovery.Extension of a number less than zero is the fractions and –ve numbers .It is important to recognize that sine,cosine balancing depend upon negative

numbers and function of a revolving celestial body around earth or any other focal point also depend upon this. But none of the Greek mathematicians believed in negative solutions to equations. Diophantus rejected such equations categorically. But Indians had accepted it from prevedic pre-Harappan times and the use of finding negative roots of quadratic equations.

But negative numbers are an essential part of mathematics as modern mathematicians know very well. Minus times minus equals a plus and this is even applied in the energy equations of the present .

14. Claudius Ptolemy (83-161 AD) misunderstood the earthcentered universe from the method of teaching of the Indians . To suppose that the earth is the center of the universe as the observer sits on it and watches the surrounding moving objects in the sky is something needed for any astronomer to start learning astronomy . If a student mistakes it for an earthcentered theory of universe put forth by the teacher and does not move forward to the next lesson it is only a inadequacy of student not of teacher. A planet move in a small circle around earth (say the moon). The center of this moon is earth which is moving in a bigger circle. The earth is moving around the sun. The sun which is the centre of solar system is moving in a very big circle than entire solar system put together. Such a system of earth, graham and nakshathra was accurate and used as guide for navigation by Indians , for astronomical calculations, meteriological observations, for religious and harvest festivals , calendar setting etc and recorded evidence of it is there from the sea trade of Harappans and their relics and weights and measures and the pictographs and ideograms they used . Between the positive and negative numbers is the number zero which is a prominent ideological symbol of India. This was invented by Pre-Harappan mathematicians of India.

Nicholas Copernicus had to arrive (1473-1543 AD) for renaissance of astronomy in the west . It took nearly 1300 years for European

mathematics to revive and that too after another contact with India

15. Al-Khwarizmi in his book of shifting and balancing gives a comprehensive guide to solving quadratic equations. He describes 6 types of quadratic equations. With an equation you shift terms on left side to right and vice versa. Then balance terms on either side. His book was a work on Indian mathematics and was named in Arabic *kitab wa al jabr wa al muqabalah*. From this the middle words when said quickly (*Al jabr*) was pronounced as algebra and that is how Europeans called it later on. There was no need to write an X for unknown in Indian mathematics. The equation was written in a word and not in a number. Each word carried a number but. (The present computer language is based on this). But Al – Kwarizmi also did not use negative numbers and treated them in a different way.

Instead of writing $X^2 - 5X = 6$

He would write $X^2 + 5X = 6$. This book had no discoveries but collected methodically the different ways of mathematics in an algebraic form and not in a geometric way.

16. when we use a geometric method of solving cubic equations we have to use intersection of certain shapes. An intersecting parabola is a sign of fish (seen in IVC Harapan and in the Tamil Pandha signs). It is also a sign of art, eros and kaama. Omar khayyam in 9-10th centuries concerned with love and wine, also systematically classified cubic equations and how conic curves could be used to solve problems approaching them in algebraic way.

In 1202 Leonardo Fibonacci applied the sequence of 1 pair, 2 pairs, 3 pairs, 5 pairs, 8 pairs breeding successively in a rabbit population and by 5th month 13 pairs will be there.

Start 1 pair = 2

1st month first pair breeds thus two pairs

2nd month first pair breeds again.the second pair is immature .so 3 pairs

3rd month 1st pair and 1st offspring breeds =5 pairs

4th month first pair and first two pairs of offsprings breeds =8 pairs

5th month $5+8=13$ pairs

6th month $8+13=21$

7th month $13+21=34$

The sequence of 1 2 3 5 8 13 21 34 with successive ratios

$\frac{3}{2}$ $\frac{5}{3}$ $\frac{8}{5}$ $\frac{13}{8}$ $\frac{21}{13}$...tends to the golden ratio of population growth in Fibonacci series.

17.A painting or a picture represents a three dimensional object on a two dimensional surface.It is the mathematics of perspective that give its depth .In a one-point perspective there is one set of parallel lines which meets a single vanishing point.This perspective is useful for painting or drawing a corridor seen from one end. In a two pointed perspective there are two sets of parallels and hence two vanishing points eg a floor with square tiles .The tiled floor paintings of renaissance(literally rebirth)was giving an impression that distant objects were far away.A three point perspective has three vanishing points.That type of geometry is needed to draw objects in depth and that type of perspective is needed to appreciate it deeply.Universe and time has a four dimensional perspective and culture and human wisdom has a multidimensional perspective.

The solution of a quartic equation is containing a term of the 4th power.In a quadratic equation the highest power is X^2 and in cubic equation it is X^3 .One step from the cubic,one reach the

quartic and the X^4 . If we collect everything on the left side of = sign the general quatic equation is

$$Ax^4+Bx^3+Cx^2+Dx+E=0 \text{ (Ferrari 1522-1565)}$$

18. The method of mathematical induction (Francesco Maurolico 1494-1575) was for proof of theorems about whole numbers. If one can prove that $n=1$ and if you can extend that proof from n to $n+1$ then you have proved it for all n . Though this logic was used by Indians, Arab and Greeks in Europe this was made known by Maurolico.

19. Galileo Galilei (1564-1642)

How a body falls under gravity? If it falls from rest the distance it falls vary with the square of time. When it falls from a height the speed is not uniform as it picks up speed while falling. First second it fall 5m ,first 2 sec 20 m ,in first 3 sec 45 m and so on. But no mention of mass of body is made here by him. The rate of fall and speed is unaffected by its mass. When a body is thrown its trajectory is parabola. The movement of a pendulum to and fro in the same time, regardless of its angle through which it swings. He supported Copernicus suncentered universe and had opposition from Catholic church .

The second law of Kepler that a planet sweeps out equal areas in equal times in an elliptical orbit around the sun was behind Galileos discovery. The third law of Kepler is that cube of distance of planet from sun is proportional to square of length of its year. Thus for earth with 365 days ,the distance is 150million KMs for him. The cube of 150 divided by square of 365 =cube of 108 divided by square of 225 . And this was for Venus, the nearest planet to earth with 225 days as year and 108 million Km as distance from sun. That is if we calculate the year of a celestial body we can calculate its distance from sun as well as from the point of observation, the earth.

The important thing is that the years of earth, the years of Venus, Saturn, Jupiter, Mars and Mercury were known to Indians and the distance of earth to sun they called the Raahumaanm (Measurement of the Raahu or Ahorathra) and determined it not as 150 but as varying from 150-153 showing that they were more accurate in their calculation than Kepler.

In 1609 when Galileo visualized moon with his telescope he was interested in the heights and depths that reveal an earthlike moon and in the play of light and shadow rather than mapping the moon and he was disproving the Aristotelian view that heaven was perfect. Moon had craters and peaks like earth and was imperfect like earth, he tried to prove. This he was quoting (and influenced by) Alexandrian philosopher John Philoponus, a Christian thinker who lived 1000 yrs before Galileo. He was challenging not only Aristotle but also church view that heavens are a better place. A perfect place. He said whatever is there is here also and both are alike and this was not against what the ancient Indians thought. The timescale only differed and all other things being similar for men, Pithru and deva etc. Both John and Galileo were considered heretics by church.

20. Logarithms as calculating aids to arithmetic was the contribution of Napier to western science. It reduces multiplication to addition and division to subtraction. Such elaborate tables were prepared by astronomers of India for easy calculation of large numbers, fractions with several decimal positions etc. Looking at such charts they could add logarithms and find out antilogarithms. Briggs published Napier logarithms and in it each number is converted to powers of 10 or dasamsa of Indians. That is logarithm of 100 is 2 as 10 to the power of 2 is 100. Logarithm of 1000 is 10 to the power of 3 and so on. So parardham or 10000000000000 is 10 to the power of 13 as the Vedic Rishi states. Logarithms of numbers in between integer powers is also found. Many quantities are

measured in logarithmic scales. Intensity of sound in decibels in terms of logarithm of air pressure is an example.

21 .The five platonic solids were all convex. With concave solids 4 more can be added making nine. These were added by Kepler mathematically .These regular pentagons, with dodecahedrons, and five sided pyramids on each face of it making small stellated dodecahedrons and a different great stellated dodecahedron. The small stellated dodecahedron was drawn on floor of St Marks cathedral in Venice. This was by Paolo Uccello in 1397-1475 one century before Kepler. Great stellated dodecahedron appeared in 1568 in a book of geometric drawings by Wenzel Jamintzer before Kepler was born. Later on Louis Poincaré described a great icosahedron. Kepler said solar system fitted precisely into a nest of platonic solids. Mercury fits into an octahedron .Venus into an icosahedron. His model of universe was based on this. Modelling universe on geometric shape of panchabhoota and building them as different models of vastu is known in India and the cubic and spheroidal weights of Harappa were some units which were following the rules. They also modeled it on an algebraic model as equations and compared the two with the observations made by each generation of teachers as the chronologies of teachers indicate.

22. Before calculating machines of Pascal and Leibnitz. before Napier ever thought of a logarithmic table the human brains had made their brains into calculating instruments. Now we are familiar with computers to do calculations for us. We have to just think of the history of mathematic calculations and computing that occurred for several millennia for us to find out such a technological device and that this technology was built on the brains of all those ancestors and teachers who thought and discovered old ideas again and again and did research on it. Every computer we use and every knowledge we possess we are indebted to known and unknown ancestors of human race on either side of the globe irrespective of

race or class and we are the inheritors of all their wisdom. No race is superior to the other simply by technological tools alone unless supported by sound, logical thinking to back up their ideas. In other words human brain is always a step ahead than the most modern computer or tool it had invented.

Therefore analytic geometry is important since it establishes the relation between geometric curves and algebraic equations. Indian philosophers, samkhya physicians practicing ayurveda, astronomers, mathematicians were very systematic in this integration. In the west, Rene Descartes, philosopher, physicist, physiologist, mathematician developed analytical geometrical ideas systematically. Modern western philosophy begins with his cogito ergo sum or I think therefore I am.

The theory of probability that began with the gambling problem was solved by Fermat and Pascal. This question influenced Pascal to systematically approach the triangle of numbers of probability which existed millennia before his triangles appeared. In China it was Yanghui's triangle. In Iran as Khayyam's triangle and in Italy as Tartaglia's triangle. In India it existed as prasthara of the chandas, of swara, and as a part of easily finding out an arithematic or algebraic triangle of probabilities of prediction among Chaturangam players, business people, among astrologers etc and among grammarians and poets and thantric and musicians to elaborate and teach their respective subjects. It had to be used as a probability distribution as in Ashtakavargaprasthara or in gayatri chandas prasthara etc. Thus it is a binomial distribution or a probability distribution for the number of successes in a series of experiments a scientist or a gambler performs. Pascal enlisted the theory of probability to support religious belief in God. He said :- God is or is not. At the far end of an infinite distance, a coin is being spun which will come down heads or tails. How will you wager. You must wager. It is not optional. There is an infinitely happy life to gain and a chance of gain against a finite number of

chances of loss, and what you stake is finite. It is no use saying that whether we gain is uncertain, while what we risk is certain.

That is reward for hope in God is infinite and worldly gains are finite.

23. Suppose we are taking the 15 Thithi of the moon from Prathama to panchadasi or 1 to 15. They are arranged in seven days of a week in groups of three. If we arrange them such that no shall walk together twice in 7 days (We know only three thithi can be there in an 24 hour day). Now give the 15 days each a letter from alphabet /or a name. Say A to O. The sequence will be

Sun	Mon	Tues	Wednes	Thurs	Frid	Saturd
afk	abe	bcf	efi	cek	egm	kmd
bgl	cdg	deh	ghk	dfi	fhn	lne
chm	hil	ijm	lma	gio	ikb	oah
din	jkn	klo	noc	hja	jlc	aci
ego	mof	nag	bdj	mnb	oad	fgj

The formula here is $\frac{1}{2}(15-1) = 7$

$$\frac{1}{2}(14) = 7$$

$$14/2 = 7$$

$$14 \times 2 = 28$$

The 14 worlds and the 28 stars of India was trying to do this geometries in which there are finitely many points. 35 different arrangements are seen in the table the double of which is 70.

Making such grids of magic squares in Leela or Gnan Choupad was prevalent in scholarly discourses and Ramanujan was an expert in it. Numbers in magical arrangement is the basis of many

yanthras like Sriramachakra .The Panchadasi or Lopamudrasuthra of India is called Lossu (Lo for Lopamudra and su for suthra) in China.Thomas Kirkman (1806-1895) defined it as the schoolgirl problem where 15 schoolgirls were arranged in three for 7 days to school as said here. In this n is an odd multiple of three ,arranging them in triplets in m lists ,so that no pair of numbers occur more than once in same triple .

If m is $\frac{1}{2}(n-1)$ or less this is possible.That is both fraction and negative number is here.

24. George Boole (1815-1864) tried to set up a system to codify logical argument as a form of algebra.This is Boolean algebra .This uses symbolic language in designing of computer and relay circuits .It also explains our neurological circuits and cosmic circuits.When I tried to decipher Harappan script I thought this as a logical way of transmitting knowledge from BC 4000 or 5000 years to AD 2009 or beyond by our ancestral brain neurochannels as computerized codified systematic way of teaching exactly what they wanted to convey through the highly technical and complex subject Mathematics and musical notation.

25.Reimann hypothesis is about zeros of an infinite series.

The Reimann zeta function is defined by ,

$$\zeta(s) = \frac{1}{1^s} + \frac{1}{2^s} + \frac{1}{3^s} + \frac{1}{4^s} + \dots$$

$\zeta(1)$ is infinite, $\zeta(2) = \pi^2/6$, $\zeta(4) = \pi^4/90$, $\zeta(6) = \pi^6/945$

whenever $\zeta(s)=0$ the real part of s ,if +ve is $\frac{1}{2}$.Riemann hypothesis is more important than Goldbach and Germats theorems as its solution give answers for many other unsolved problems.

26 Maxwell summarized electricity and magnetism .These fields are propagated through spacetime at speed of light. The speed was 186000 miles/sec ,the same as speed of light .The electromagnetic field and light wave was same .When Paithamahasidhantha takes

366 days (183 \pm 3) to 180 \pm 3 ,this is indicated and the Raasimandala(mandala is a field of energy) itself is the spacetime in which light travels creating such a field as it travels all around .Light consists of electromagnetic waves .Our nervous conduction also is in electromagnetic fields.

27 .The countability of fractions and uncountability of real numbers (George Canter 1845-1918).the series is ----3----2—1---0,1,2,3 , and so on.Only if we include zero and the negative numbers we get the integers .So,that was why Harappan mathematics of India was using zero and fractions.They knew integers .

The integers are countable.For that one has to list it as 0 1 --1 2 --2 3 --3 and so on.That is why the Harappans gave fractions and negative numbers in their weights and measures.Every natural number is an integer 17 is 17/1

Two sets of natural numbers and integers as a pair each will be

. 1 2 3 4 5 6 7

. 0 1 --1 2 --2 3 --3 ...

The infinite list on top including all natural numbers and the bottom including all integers.The two lists are paired together so that as many numbers are in top list will be in bottom list too.Therefore bottom list of integers also is countable as natural numbers.But this is an infinity too and hence uncountable too.

If we take 6 as a number of columns horizontally and vertically (as 6 seasons and 6 chakras of body from Moolaadhara to Agna) and count fractions in a systematically arranged pattern counting across the diagonal or karma (which also means the ears/sruthy in Sanskrit) the list will be in 36 columns with lot of repetitions .These are the countable +ve fractions with an infinity that is

natural and repetitive and it is the basis of Melakarta raaga scale also.

	1	2	3	4	5	6
1	1/1	2/1	3/1	4/1	5/1	6/1
2	1/2	2/2	3/2	4/2	5/2	6/2
3	1/3	2/3	3/3	4/3	5/3	6/3
4	1/4	2/4	3/4	4/4	5/4	6/4
5	1/5	2/5	3/5	4/5	5/5	6/5
6	1/6	2/6	3/6	4/6	5/6	6/6

The series here is 1/1 1/2 2/1 3/1 2/2 2/3 1/4 2/3 3/2 4/1 and so on.

Or 1 1/2 2 3 1 0.66666 1/4 0.6666 1.5

1 0.5 2 3 1 0.66 0.25 0.66 1.5

Thus infinitely recurring and repeating natural and integer numbers are there and the Harappans used it in daily life. When Cantor first recognized them and named these as infinity \aleph_0 he was called a charlatan, a renegade and a corruptor of youth and he died as a mental wreck (though he was not drowned as the Pythagoreans drowned their Guru) due indirect attacks and personality assassinations. Treating infinity as if it is a number was not accepted (1845-1918). But he had also said that the real numbers are ultimately uncountable too. There are different levels of infinity. Infinity of real numbers are greater infinity of whole numbers.

Natural numbers 1 2 3 4 countable

Integers and fractions also countable.

Real numbers are numbers with decimal expansion (on which Indians were experts). The expansion may either terminate or continue forever. One can list the countable numbers as below.

1 st	3.294759
2 nd	5.268370
3 rd	8.371541
4 th	0.387928

Take a diagonal from this decimal. Starting from 2 in the first number the diagonal is 2619. Change each of these numbers by alternately adding and subtracting a number from them

2 to 3, 6 to 5, 1 to 2, 9 to 8. The new number 3528. This number cannot appear in the list. So real numbers are not countable. Any attempt to count a real number will leave one out. The infinity of real numbers is strictly greater than infinity of natural numbers. This is written as 2 to the power of \aleph_0 .

To apply this to the squaring of circle, it is impossible to square a circle because it is not a solution to an algebraic equation and cannot be done in a Euclidean space. But it can be done in a non-Euclidean space which was the space of our Harappans/Indian rishis. π is transcendental for them and this property of π was known to west only with Ferdinand von Lindemann. (1852-1939). Euclid was dealing with geometry alone but the Harappans were doing something more than that with their mathematics.

Cantor hypothesized that infinity of natural numbers and of real numbers is the same so that there is no contradiction in it. Godel also said this is consistent and contradictory. This is the same infinity of Brahman and prakrithi – The ekam and anekam of ancient Indians. I am finding a correlation coefficient between

the western and eastern science here. When data seem to suggest a connection between two quantities, ideas, cultures is it a pure chance or is there something beyond chance there? In Medicine we try to find out a correlation between aetiology of cancer and meat eating or tobacco smoking. In psychology we search for connection between extraversion and schizophrenia. In sociology researchers try to find out connection between social class and longevity and so on. The investigator collect and tabulate data and draw graphs to show relation between the two. Is there a definite pattern? Is the pattern due to random fluctuations even when there is a definite pattern ?

That is why I am searching each and every part of our knowledge systems (Philosophy, medicine, biology, chemistry, physics, arts and science of ancient and new worlds and of India and Europe ,astrophysics and mathematics and languages of India with the history of anthropology and science and development of human consciousness and its development in relation to civilizations in each. The pattern I get, prove that it is not any random fluctuation but real and that India had been the Guru of the west right from the beginning .But this I do not apply to superiority of Indian race but to the presence of the rich agroeconomy, industry, trade and searoutes which they developed and this was at least from 7000 BC means the civilization existed even before that .).

There is a story of an argument about mathematics between the tortoise and Achilles. The argument goes on forever. Whatever proof the Achilles brings about deduction of a triangle with two sides which is isocles according to Achilles but has one side measuring 12.7 cms and the other is 5 inch long. But isocles triangle has to have two equal sides. So the tortoise traps Achilles into a infinite regress of implication. The argument goes

on for ever in science in every era. Where does the formal logical deduction and the common sense reasoning begin and the other ends ? This puzzle was raised by Charles Lutwidge Dodgson ,author of An elementary treatise on determinants better known as Lewis Carroll (Author of Alice in wonderland). It is the slow moving tortoise on which this entire logically constructed universe moves so fast is the one who always wins in the end. Queen Victoria(1819-1901 reigned 1837-1901) asked him to send his second book when she read Alice in wonderland but was disappointed to get An elementary treatise .

When we take larger numbers proportion of primes decrease in a logarithmic pattern

Number n	Number of primes $\pi(n)$	Ratio of decrease $\pi(n)/n$
10	4	0.4
100	25	0.25
1000	168	0.168
1000000	78498	0.078
1000000000	50 million	0.05
1000000000000	38 billion	0.038

Value of $\pi(n) \ln n/n$ is 1.08. for $n = 1$ million

1.04 for $n = 1$ billion.

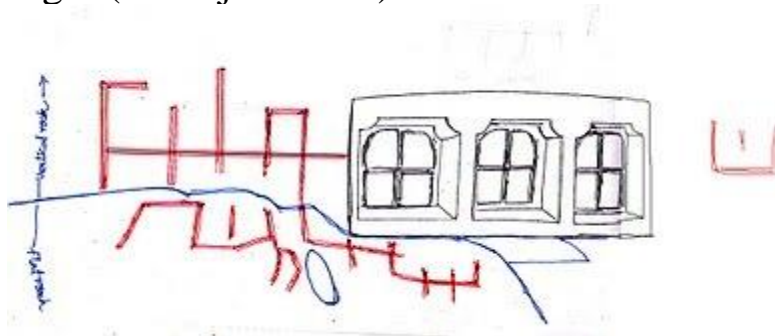
The ratio is therefore tending to one. Only in late 19th century this was proved independently by Hardamard(1865-1963) and Poussin(1866-1962). The proof of this theorem is very difficult and advanced and brings in many notions unconnected with

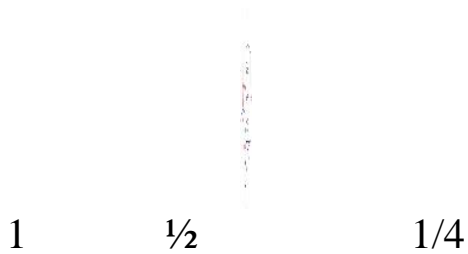
primes and logarithms. Erdos (1913-1996) found an elementary proof for it. In it the proof is still difficult but it does not involve advanced mathematics. This prime number theorem which is difficult to prove was known to Harappans as their weights and measures and other artifacts and culture show.

**Reading Branthachalam cave inscription sent by Manoj Chakiar from Perinthalmanna
(Orkut Community Indian History)**

I read the inscription sent by Manoj Chakiar as an important find in the link between Indus valley people and Kerala carpenters/sthapatyaveda .

Fig 1 (Manoj Chakiar)





This is a geometric progression or a division of a scale according to geometric sequencing. The indication is that the sthaphathy who wanted to build the cave structure was very learned in the Indus valley use of measurement systems and was giving instructions of how the vasthu has to be built and how he measured it by his Kol or measurement rod for his assistants or helpers to follow and learn.

Below see his shape of measuring instrument which we can reconstruct from the above figure.

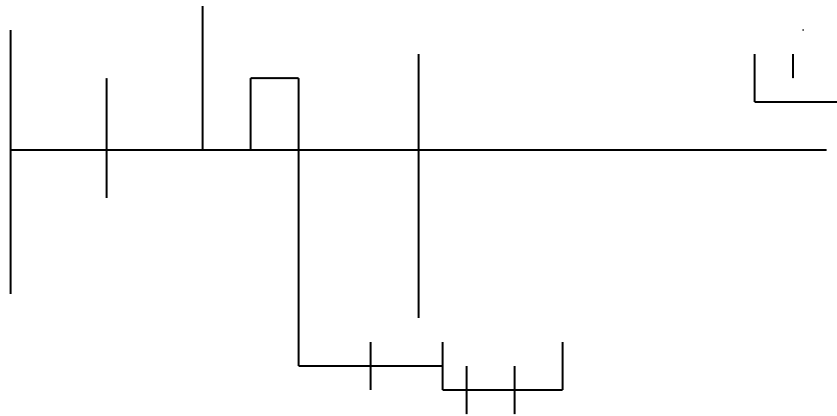


Fig 2 (Dr Suvarna Nalapat) The first divisions of a Muzhakol /measuring scale for a vasthu by a carpenter. The division above the central line are dhana(+) and Aarohana, and below are Rina (negative or avarohana). Used both in music and astronomical calculations alike.

100:50:25

Or $1 \frac{1}{2} \frac{1}{4} \frac{1}{8} \frac{1}{16} \frac{1}{32} \frac{1}{64}$ and so on.

The second is $\frac{1}{3^{\text{rd}}}$. That is 2,6,18,54,162,486 and so on

The scale of Arohana and Avarohana .(musical)

The + is above and --- is below the horizontal line .Smaller divisions /fractions in geometric progression series..

When it is avarohana scale the geometric progression is getting into smaller and smaller numbers but does not reach zero .Example is 5,1,1/5,1/25,1/125,1/625 and thus a cosmic scale which is larger ,gets smaller at terrestrial level measured .That is ,what is larger in the cosmic and solar sphere will be smaller at terrestrial and human body level.

But the geometric progression rules are same. The ratio remains the same.

If we run a race of 100 meters .At halfway you have only 50 meters to cover .Then after running halfway of that 50 only 25 remain.That is the distance from one point to another decrease as 100,50,25,12.5,6.25,3.125 and so on but will never reach zero .The cosmos shrinks but never to total destruction.It will ever continue to decrease in smaller fractions and then a balancing force appears and sets it wellbalanced.This is the law which the Indus valley people followed in their weight and measure system which was very accurate.

Western science knew about this law only very recently .That is the importance of this inscription on rock.Kerala being a mathematical and astronomical center and a place for the Aswalayana sakha of scholars and saamavedins this measurement has importance.It also gives some clue to how the early sthapaty(mentioned in yajurveda) designed the cave architecture which we see sprinkled all over India.

Then the Naama sign or U with a central line which is symbol of Indus valley people/Vaishnavites.

Below ,the same with the Y nama is also shown in a reverse pattern.

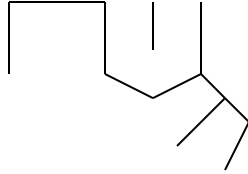


Fig 3 (Dr suvarna Nalapat)

The three doors each divided into 4 equal compartments to make up 12 is the Rasimaana or the total measurement of the cosmic/vasthu scale unit.

In musical parameters the Naama sign with a U and a central line is the Laghu Mathra .In Arohana and the same in inverse pattern show its avarohana.In the case of a cave the portion below and above ground level is the avarohana and arohana scales..

The seven notes (with three udatha,anudatha,swaritha) and the 12 swarasthana are also represented in this Indus valley script.The occurrence of this in Branthachala is therefore important.

The Sthapathy /Sthapathyaveda of the region is well represented by the measuring scale of the carpenter/Sthapathy .In the vedic language sthapathy is a important component of society well respected .The presence of cave dwellings first and then dwellings on level ground is a characteristic feature of human habitation and presence of measurement scale on a cave is therefore important as far as human habitations and development of consciousness of measurement is concerned and the Indus valley people were able

and expert mathematicians and their weights and measures were of world renown.(from archeological evidence)

See the U shape with divisions to form the ratios of a musical instrument of a cave painting below. The people are early men catching rats from holes and they have the early sign of U and the first sign of a man and woman building a home together.

Just like a rat (Mooshaka) lives in a hole in ground, a human being in earliest period started to dwell in natural caves called Mada in regional language which later became the Mutts of sanyasins. Even in Australia the oldest cave dwelling of prehistoric men are called Mutts.



Fig 4 Cavemen

Below see an Indus valley picture of Squirrel with measurements on the tail, which seems to be a musical instrument.

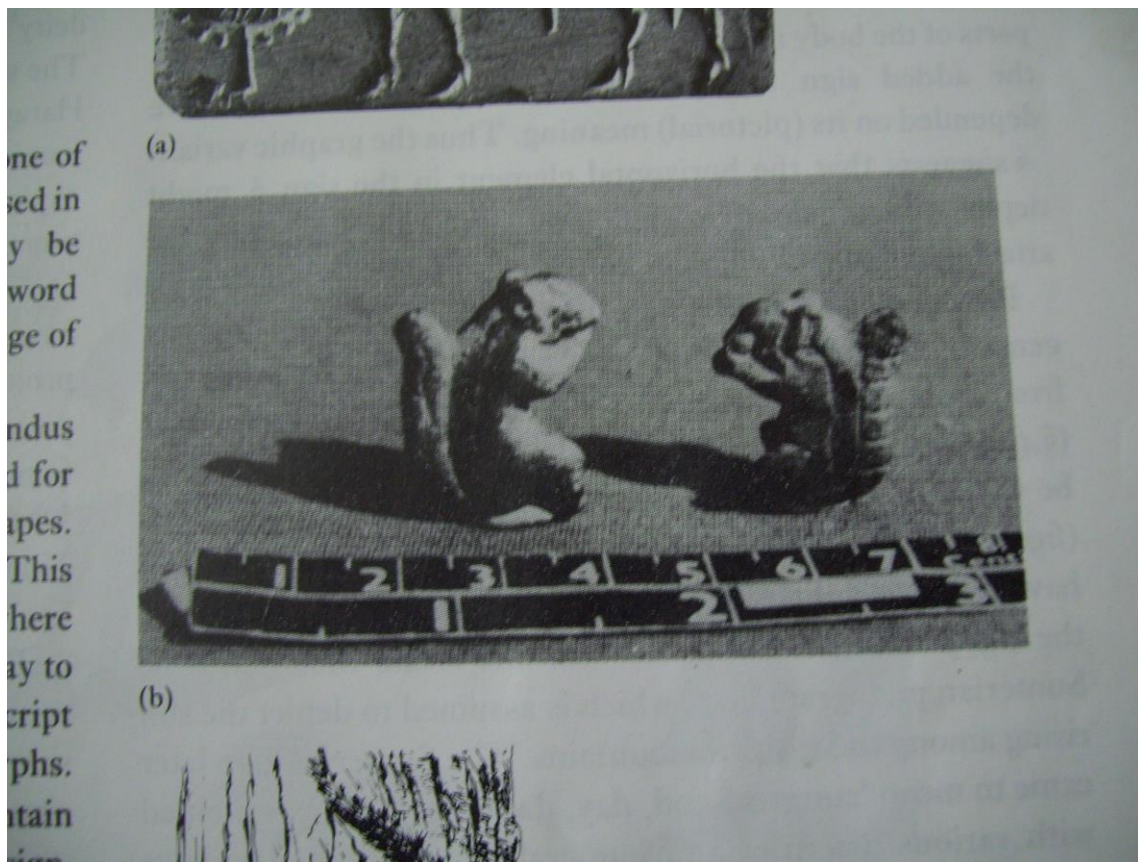


Fig 5 (Thanks to Dr Asko Parpola, The Finnish Researcher .)



Fig 6 (Dr Asko Parpola) Indus seal.

Note musical percussion instrument, 5 swastiks in a row, the U sign with modifications and astronomical geodesics /mathematical knowledge with two superimposed circles. The two intersecting circles are worth noting for the astronomical knowledge.

Swastika for the Townplanning and the Cosmic Cakra/mandala and the spread of soundwaves in space .

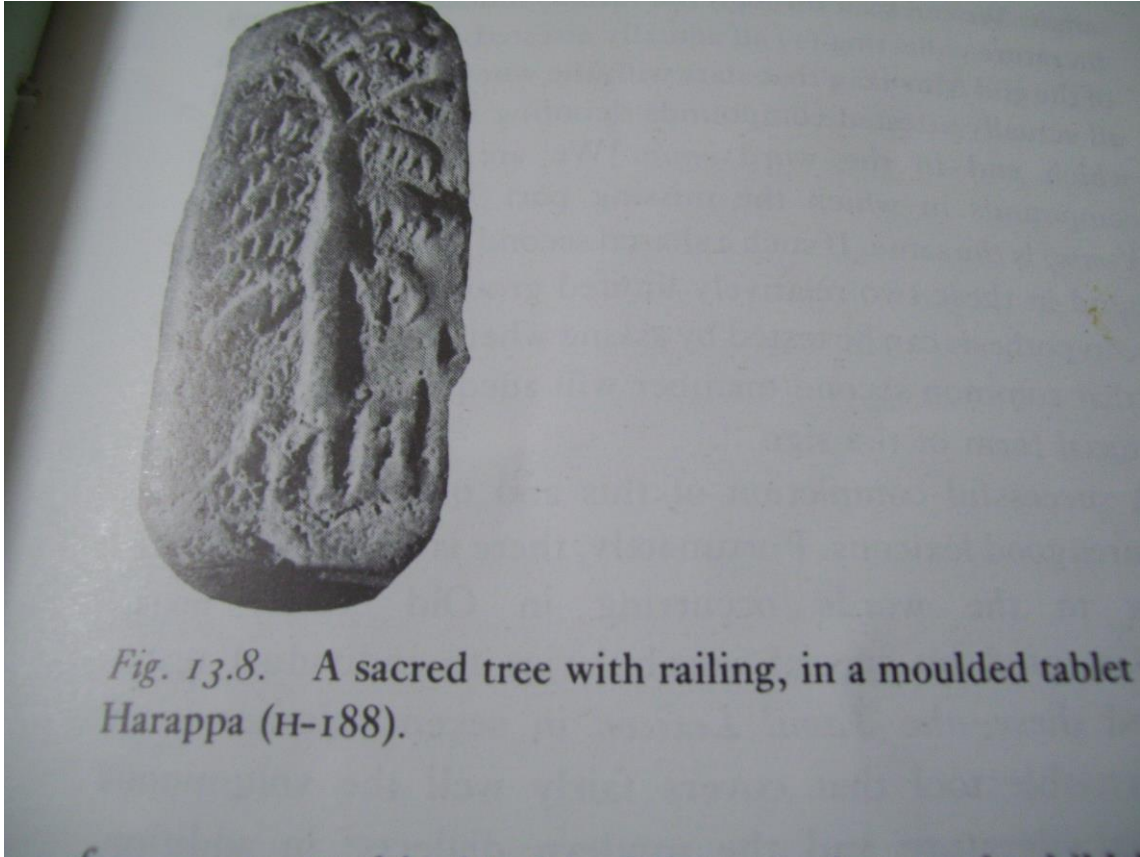


Fig. 13.8. A sacred tree with railing, in a moulded tablet Harappa (H-188).

Fig 7 (Dr Asko Parpola)

Look at the divisions of the railing and also of the leaf blades .See that Harappans were worshipping nature /trees and protecting the trees with proper railings .This shows their ecofriendly nature and concept about nature .The plants/trees/oushadi vanaspathy are dwelling places of celestial beings who are great musicians (Apsara/Gandharva and fertility devathas) and healers through the solar energy and lunar water flowing through them to all living things as annam (food).Therefore all people worship them as celestial parents .



Fig 8 (Dr Asko Parpola)

This habit of treeworship is imitated even in Buddhist sculptures showing a continuity of tradition. Look at the division of the base, the leafs and of the staff in the hands of the attendant below. Also see the inverted Y shaped stand on which the entire structure stands and the same figure on the staff of the attendant. It denotes the Urdwamoolam adhasakham (root up and branches below) concept of the vedic Aswatha tree.



Fig 9 (Dr Asko Parpola)

Note the base ,the designs on it,the swasthik ,ashtadala ,measuring jars and other astronomical signs in this recent picture of Worship of Sun(Gayathri)and the fig tree.Note continuity of same practice from Indus valley /Harappan days till date.This is a living tradition still .

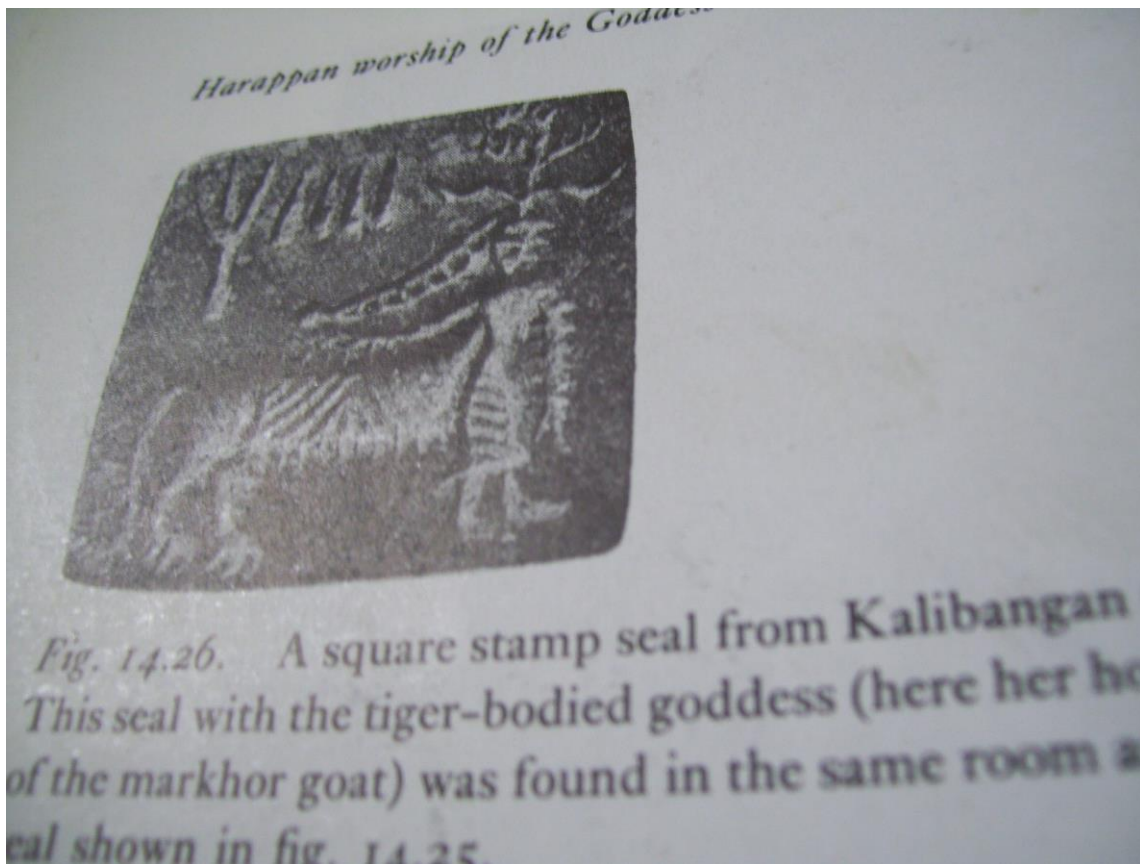


Fig 10 (Dr Asko Parpola)

See the first letter with a Y naama and a line between the two limbs. The headwear shows twigs/tree showing that she is the Goddess of life .

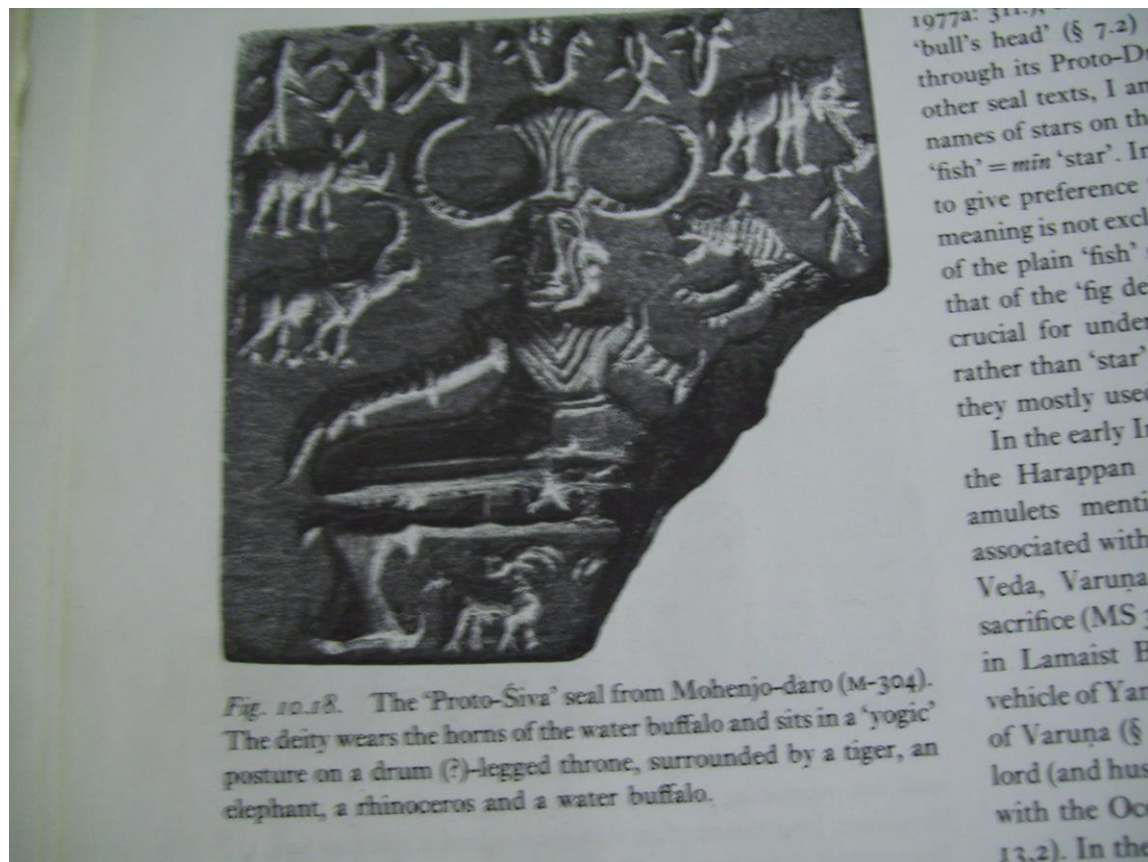


Fig 11 (Dr Asko Parpola)

Here also see the headgear and its resemblance to the U naama .The Rishabha is a term for such a yogic person.(The Rishabha or Rishi).Note the divisions on the central part of the headwear.Then you will be able to appreciate the inverted V and Y in center with two outer divisions altogether making 8 points and 7 spaces in between and on the two curved horns on either side one can see the measuring scale .An elephant with a Mahout walking along shows domesticated elephant.And the first sign here is a man using a plough with an Ox and an instrument with U shape and a handle just as we find in the cave people drawing .(Note that in this yogic picture there is no serpent shown .)

Recently a scholar from Adyar library,Sri Sankaranarayanan (Director of the Library), asked me whom do you think that yogin

picture seen in Indus valley seal is ? I said:-Everyone,including Dr Asko Parpola say that it is Shiva/Pasupathy.

The elderly scholar asked:-Is not Vishnu a yogin? He is always in Samadhi.And Is he not also a pasupathy/Gopala? So what is the difference?

Any Yogin can be depicted in a yogic pause.And the signs of shiva and Vishnu including the serpent (Vasuki/Ananta) are signs of Pragnaparamitha in later Budhist scholar's works. Seeing a serpent hood historians immediately come to the conclusion that this site is Budhist/Jainist .Whoever started this mistake first ,This mistake is often perpetuated in academic circles.The question of Sri Sankaranarayanan , is therefore very relevant.Asking questions by oneself is inherent part of science.

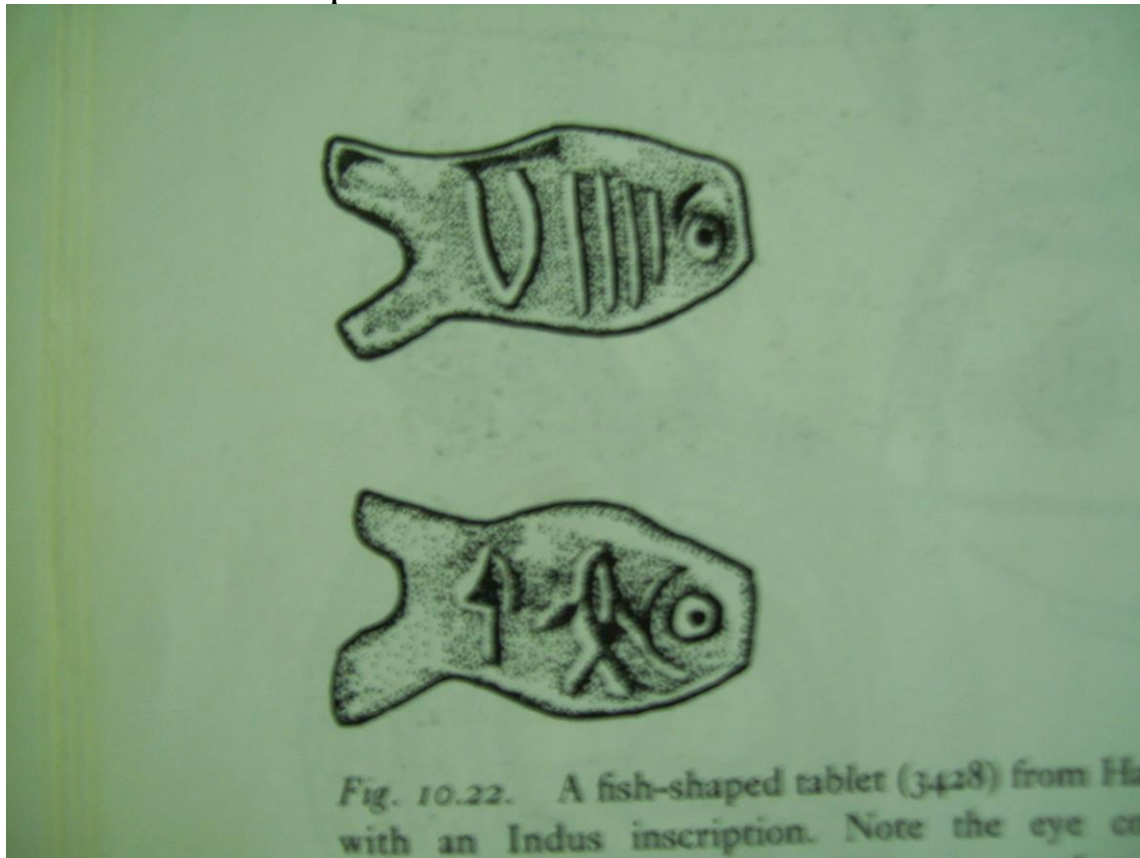


Fig 12 (Dr Asko Parpola) Note the U and the Y signs in this fish tablet on either side.

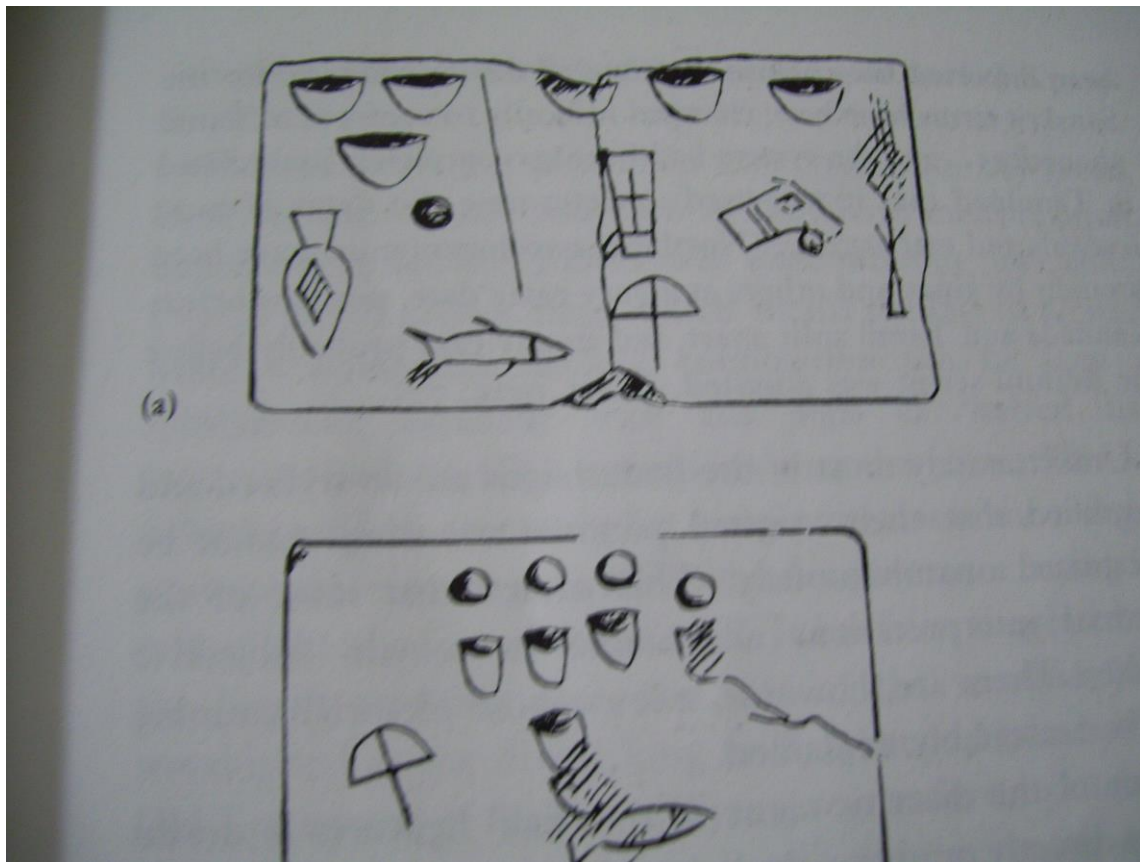
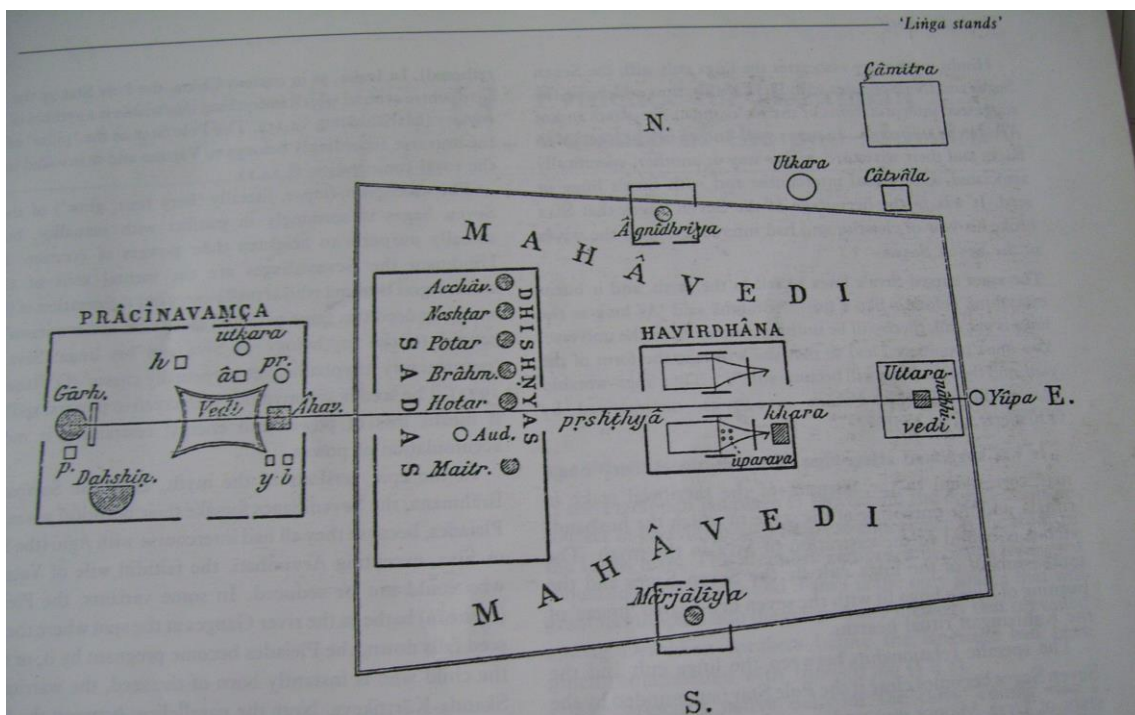


Fig 13 This tablet from Sumeria

This shows the altar of a sacrifice as in Somayaga. The 7 dishna or fire altars and the Yupa (represent the tree) in front of the Aswa denotes the Aswamedha yagna. The Aswa in Greek is Hippos. So this is a Hippos or Aswin who has gone through the oceanic routes (see fish sign) and measured the entire universe (see measuring jar) and the urns for containers of things and wealth and has brought the entire universe under one umbrella of God as servant of God (Ekachatra) as seen by the umbrella drawing. This must be the practice adopted from India since Indians had trade relations with Sumerians. Somayaga is not a tradition in Sumeria as we know now. But is a tradition in India and if we see that sign in Sumeria, we have to assume that the sign had been planted there by an Indian living there, probably for trade relations.

Below see the dishna from an excavated site from Kalibangan and a drawing of the Yagnavedi even now followed by all vedic sacrificers
(Fig 14 and 15)





2.15. The fireplaces (*dhiṣṇya*) of the 'seven sacrificial priests' in the Vedic Soma sacrifice. After Caland and Henry 1906: 1, pl. 4.

may not be relevant here. Number '7' is followed should be possible to find a solution. Moreover, since

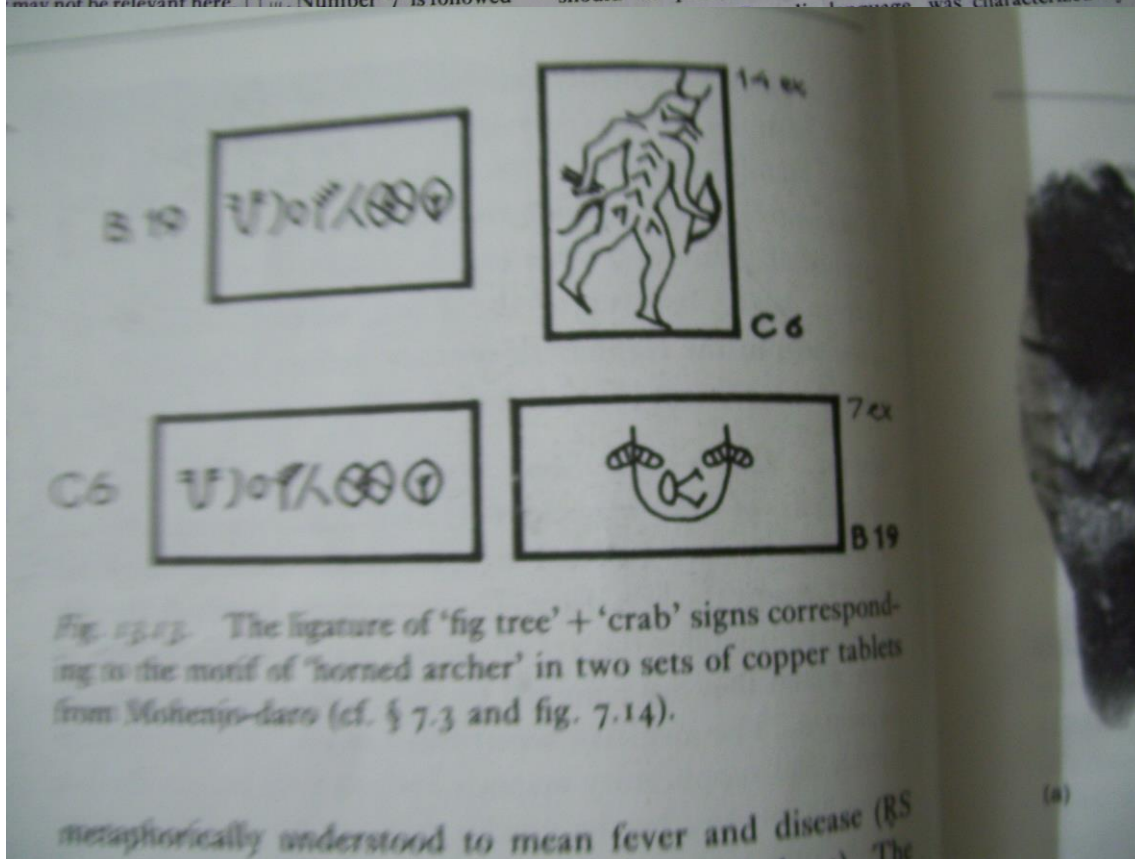


Fig 16. Apart from the U and Y signs and intersecting cycles and fig sign see the Vettaikku Orumakan /Ayyapan figure in a leopard attire which is a star cluster in Orion nebula. How this Rain and life(tree) is associated is seen from this. See that this is done on copper plate showing the knowledge of mettallurgy among Indus valley people .

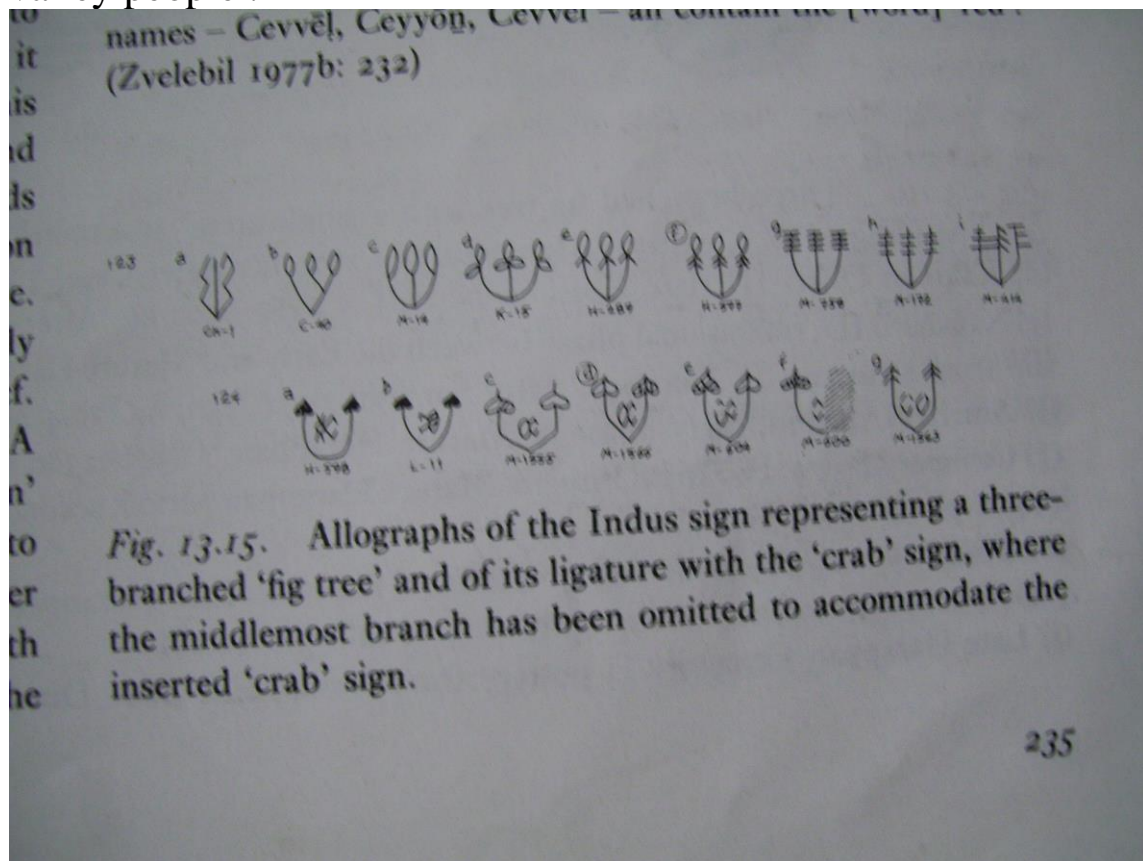


Fig 17

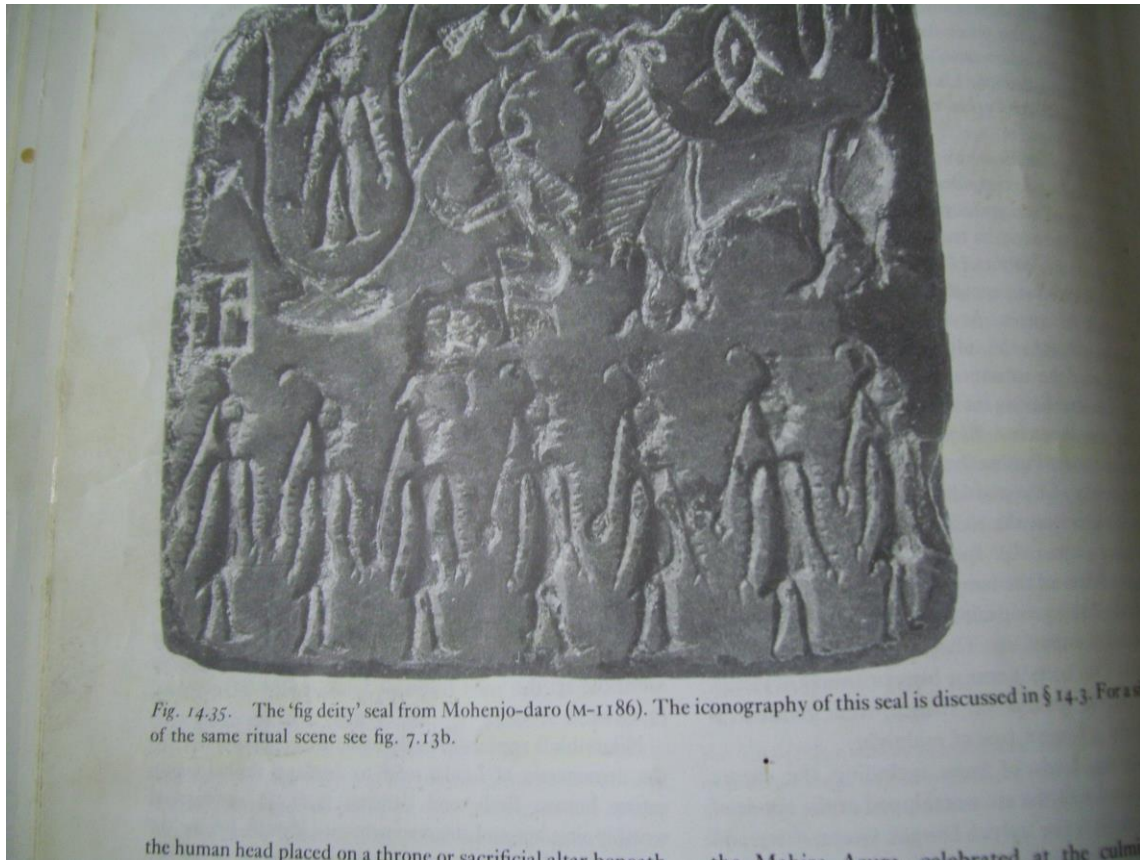


Fig 18 This is an important seal. Here the 7 Goddesses (swara) and their sister Saraswathi as Goddess of Tree is worshipped and a kamadhenu shown. the square, fish sign and the headwear of the worshippers as well as the Goddesses are to be noted for the same measurements and pattern. See the Saptarekhyanthra of Gargyaparasaravali. (A handwritten manuscript)

Fig 19 Saptarekhyanthra of Gargyaparasaravali.

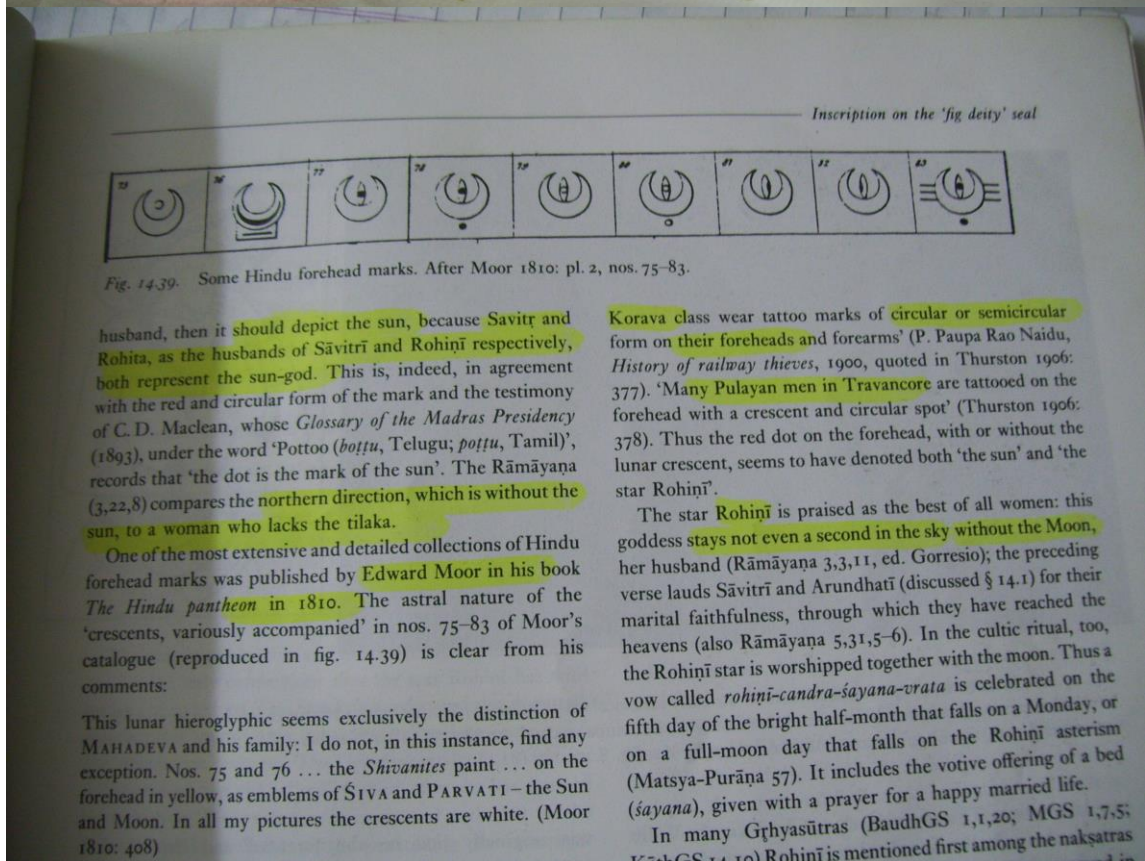


Fig 20 and 21 show the U sign on forehead of people (Anthropological sign) and the Indus seal



Sri Manoj Chakiar has given me the approximate measurements of the fig 1 as below:-

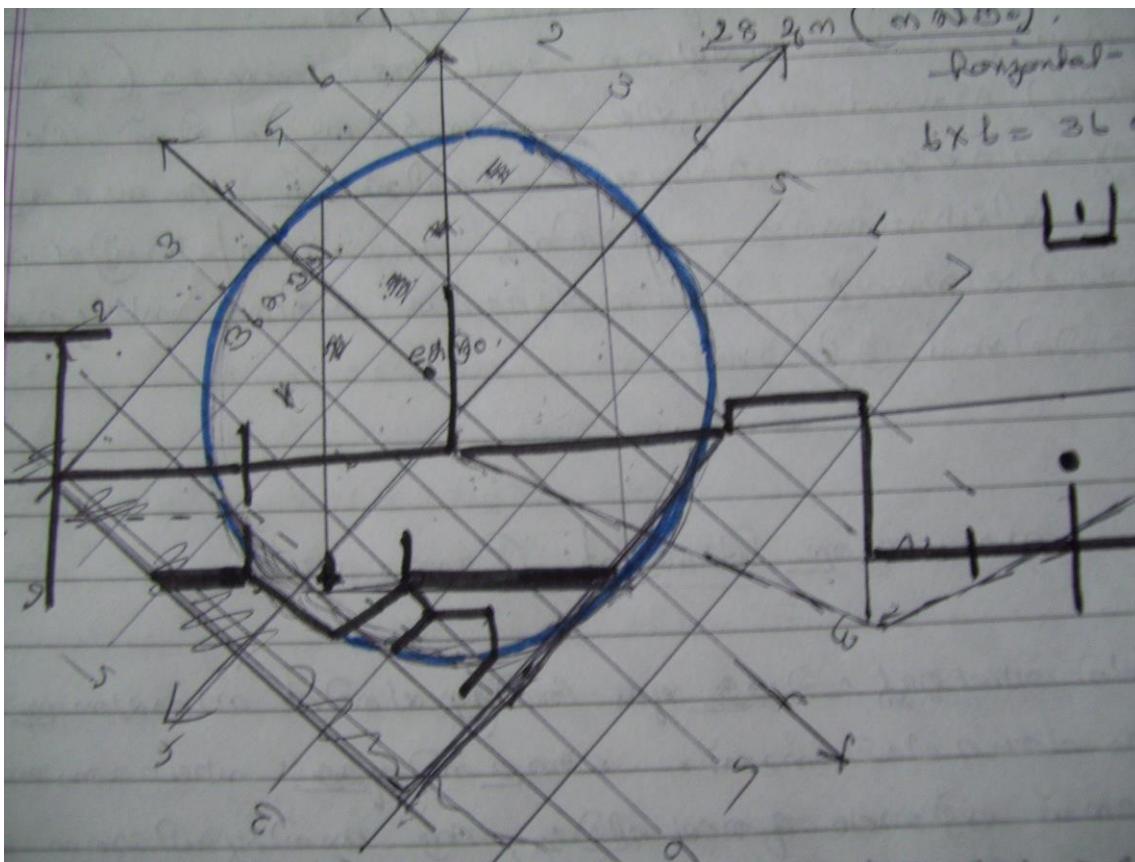
The part above ground level (inscribed on the hillface) and the inscriptions on the floor where we stand (that is on earth surface) is demarcated very well by a limiting line.

The doors shown is about 8 ft in height on hillface. The height of the inscription is about 5 ft height and 7-8 ft in length. The U mark has 6-9 ft size.

That means the Sthapathy was marking out the exact site and size where his disciples or the associates should carve out a cave. It is a specific inscription to show how he had instructed the disciples to carve out the existing caves there, and also how any one who wants to know the method can come and see and learn and go and try his new earned vidya elsewhere. Just like a lecture demonstration by an early teacher of silpasasthra. Such Sthapathy are venerated in Yajurveda as great people. Once in his former birth, Sri Krishna was born as Oja, the son of Suthapas and Prisni. And Oja is considered as the one who organized Silpasasthra. In Chalukya inscriptions the sthapathy of the constructions are always named after this Oja showing the continuity of tradition and knowledge of it upto historic times.

In Gargaparasaravali the sapthaslakhyanthra shows how this figure can be reconstructed by us.

Below see the sapthaslakhyanthra Gargyaparasaravali reconstruction on to Branthachalam cave vasthu measures. Fig 22 (Manuscript page from Dr Suvarna Nalapat)



It has 28 points on outer aspect(the 28 star clusters on cosmic scale)36 equal squares making up for the 360 degrees of a circle /the vritha of geodesic in a solar system and in universe,and 7 lines (swara,colours,days of week) make up the entire structure of microcosm and macrocosm at one scale.This is what both astronomy,vasthusasthra and ayurveda ,as well as musicology use in its scientific expositions.Yanthra means the machine or the basis of construction of a machine /scale for any purpose .Thanthra means a mechanism or method of construction of that and use of that(prayoga).The manthra is the laws which one has to understand and memorize for getting proficiency in that particular branch of knowledge.The problem with modern historians is that

- 1.Either they ignore entire knowledge system as myth
- 2.Or they propagate the existence of such ancient procedures to superstitions ,thereby promoting superstitions among common people.

Both these attitudes are not good for a developing society which should know its past for devising and planning a better future for generations to come.

We have to analyse them scientifically to know them properly and only then we can tell the people that Indian knowledge system is the Indian religion and spirituality and negating that is the greatest mistake that modern scholars are doing ,thereby equating Indianism(Hinduism)with semitic religions which are teachings/morals/ethics by a individual in a particular region.

The word Hindu stands for Indian .The pronunciation of Sindhu /Sapthasaindhava had become Haptahaindava among the Parsweekadesa(Parsi)people who speak a slightly regionalized dialect pronunciation and this later on became Hindu and India subsequently.So to say that our culture is myth and religion is to negate our entire history and existence.To be an Indian one has to know its culture ,past and ancient languages.To separate a nation is easy by means of several dualisms and that is what is happening to

our academicians and politicosocial groups. And we as a nation are suffering from such separatist tendencies. To understand India one has to know its ancient culture and respect its history before any other influences from outside ever reached its soil and that takes us beyond all religions .Beyond all power politics. Just to human culture and consciousness .

Cant we ever see this truth is the question history asks us. History is not for perpetuating differences of opinions but to resolve them by proper use of human brain (Pragna) and Budhi (intelligence) and seeing and observing, analyzing and hearing again and then doing analysis or manana forever to enrich our wisdom . Wisdom is in peace, protection of biodiversity and uniting for such a noble cause. India has always been at the Gurusthana for that teaching from what we learn from its literary wealth, archeological evidence. Every Indian ,if he/or she is having a mind to see truth can see this . This itself is the test for verifiability for all people. Verifiability by any person is the hallmark of science. But for it ,one has to have a systematic study of the discipline concerned. That is lacking for Indian historians who negate every Sanskrit literary source as myth /religion and who negate every new discovery by a subaltern individual as not peer-reviewed . To be peer reviewed first of all one should get a chance to speak out. If even that freedom of expression is denied to subaltern historians how are we reaching a point of metascience ?

Therefore ,I take this opportunity to see the material which Mr Chakiar had sent me ,in a different angle from the usual academic historians do .

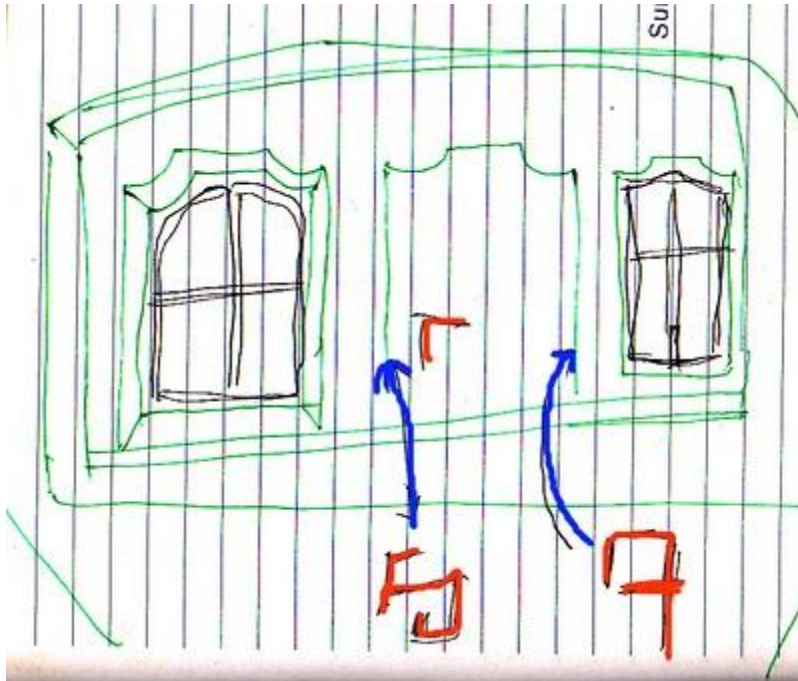
I myself do my history research from a very subaltern point of view starting always from Kerala but it never ends there. It encompass entire humanity, entire living beings through a microscopic lens of Kerala and its culture. The microcosm always mirrors the macrocosm is what I have found.

May peace prevail on earth. May Satya and Ahimsa and Dharma be the ultimate aim of human race so that all living things enjoy their share of freedom of life and expression on this planet earth.

Satyam Eva Jayathe!

From

Dr Suvarna Nalapat



This is the inscription in the cave Mr Chakiar has sent to me later .This shows three letters one above (in the central wall of central cave)and one each on right and left walls.

This is very interesting because it corroborates what I have already interpreted.

The letter on the right wall is read as n/na (pronounces as in Money , as the last anunasika of the Tavarga/not Thavarga)and the left hand side is read as Kai /ke/or even simple ei in Phoenician /Brahmi lipi.

The upper central lipi is a letter which can be read in different ways .It resembles (but with rotational changes) the Ta in Tamil alhabet,and also a modified A (pronounced in Tamil like that),and a rotational changed pa and cha in Phoenician and Brahmi alphabets.

So we have different readings from this three letters.

- 1.Tanikai/Thanikai
- 2.Pan(i)kai
- 3.Chan(i)kai)
- 4.En(i)kai

If read in reverse order it can be

- 1 Kaithan(i)
- 2.Kaippan(i)
- 3.Kaichan(i)
- 4.Kaienn(i)

Pani/Phani /Enkai(ganitha),Kaiennal etc have definite correlation with the vasthu and its measurements.

Than or Thanikachala is the mountain which gives cool atmosphere and sama for the people who do meditation.In Valanchery ,there was a hill called Thaniyappan kunnu which was recently destroyed for construction purposes deserves mention.And nearby was another hill called Kottaram Kotakunnu showing it to be the old dwelling place and fort of an erstwhile dynasty (which also is no more thanks to destruction/construction work).

Chankai means shanku or conch which is a musical instrument used in temples and a symbol of Vishnu,well as Devi .The place is ideal for giving a sound message to the neighbouring places due to its location and height and hence used as a watchtower of metereological observation as well as for defence purposes to warn villagers around of a natural or artificial calamity approaching.

Kaithan is to show the Neerkaithankotta (oldest natural cave in the area of Parappanad to which history relates to Rama and his monkey army)where several beautifully carved structures are added by the sculptures.Probable relation to neer and kaitha (water availability and a built structure by the hand of a sthaphathy for making it occupiable).

Agriculture during Koutilya's Arthasasthra(BC 321-298)

Vidya include four varieties. Anwikshiki, Thrayi, Vartha and Dandaneethi. For disciples of Manu Anwikshiki being a branch of Thrayi there are only three types of vidya – Thrayi, Vartha and Danda. For disciples of Brihaspathi there are only two vidya – Vartha and Dandaneethi. For them Thrayi is a protection for those who know the journey through life. For disciples of Sukra only Dandaneethi exists. Koutilya accepts four as vidya and they are for knowing dharma and artha.

Anywikshiki:- Samkhyam, yogam and Lokayatham.

Thrayi :- dharma and adharma and their knowledge. (The three Veda saama, rk, yajus). The Atharva and Itihasa and the vedanga also come under it. Thrayi is for all the four varna and four ashrama to protect swadharma.

Swadharma of Brahman:- learning, teaching, yajna, giving or daana, prathigraha.

That of Kshathriya: living with knowledge of weapons and instruments, protection of life. learning, yajna, daana

That of Vaisya:- learning, yajna, daana, krishi, goraksha, and vanijya. Of soodra:- Service jobs, vartha or message and news, sculpture and arts, kuseelavakarma (dance, music)

Vartha:- artham and Anartham

Dandam: Nayam and apanayam .

Anwikshiki examines all these and their strength and weakness by logic and thus by enquiry decides which is best for the world. It keeps intellect not wavering in pain and pleasure and increase efficiency in pragna, vaak, and karma .

What is Vaartha or Vaartika?

Vartha is krishi, goraksha and vanijya which means the dharma of vaisya and sudra overlap. It gives grains, cattle, gold, tax, gifts etc

and by that treasury is filled and king is able to carry out protection of his people.

After cholakarma(cutting of hairs .It is from choula the word Chola originated).all children learn lipi(writing)and Samkhyana (numbers).After upanayana children learn from qualified teachers Thrayi and Anwikshiki,from the various Adhyaksha they learn Vaartha,and from teachers of practical knowledge of law dandaneethi.After 16th year (Brahmacharya)do Godaana and take to grihastha life.

In the past when people were troubled by Matsyanyaya(large fish devouring small one)a law was made and VaivaswathaManu was made emperor and it was decided that all should give 1/6th of grain and 1/10 of other produce and gold to him. With that the king has to live and protect all people .Even the forest tribes(Aranayka)give 1/6th of their Uncha grain(which is not cultivated but gathered from forest wild grains) for protection.

Sons of the king have to live from gifts of gold he gets, or by making artificial gold or jewellery,or by trading with silver and gold or by taking the wealth coming in ships etc.He can take the job of a Kaaru,silpi,kuseelava or a vaidya or of a vagmi,pashanda etc and live by that .

Division of the day and night:-

Dividing day by shadow Into eight .The shadow length of three persons is Thripourushi.If it is one person long it is pourushi,and only 4 finger long it is chathurangula and no shadow is noon The same repeats in reverse order for noon to sunset.

In first 1/8th part or thripourushi do means of protection and hear about the expenditure and the gains.2nd 1/8th part of pourushi hear and look after the citizens matters.3rd 1/8th chathurangula is for bath and food. Also for swadhyaya.The 4th 1/8th take the gold obtained and employ various Adhyaksha in duties.5th 1/8th is again chathurangula and have discussions with the ministers in a sabha and get news from the intelligentia or gupthachara.6th 1/8th is for free plays or personal affairs or for manthra.7th 1/8th is for examining elephants,horses,chariots,and army .the 8th 1/8th is for

discussion with commander in chief about defense or battles etc. Then sandhya come and do sandhyavandan.

The night is similarly divided by using a Nazhikavatta.

1st 1/8th part of night for talking with goodapurusha (secret men or intelligentia). 2nd 1/8th for bath and eating and swadhyaya. 3rd 1/8th for hearing instrumental and vocal music and 4th and 5th 1/8ths are for sleep. 6th 1/8th to awaken with music and instruments and to think of sashtra and that day's duties. 7th 1/8th for seeing goodapurusha and manthralochana. 8th 1/8th for swasthyayana with rithwiks, Guru, Purohitha, doctors, chief cook, astrologer etc and to see the dhenu with its calf and a Rishabha and to circumambulate them and then go to the durbar. Thus the day to day activity is fixed systematically.

How does a king make a new janapada or a dwelling place of people?

By bringing people from neighboring areas or by taking excess population from his own land, king can recreate a new janapada where it existed once, or where there is no janapada. The majority of people should be farmers there and of service section farmers and it should be minimum 100 and maximum 500 family strength (The anjoottuvar) and from 1-to 2 krosam in extent and with ample protection in the limits. At the limits of villages a river, mountain, forest, deep pits, great lakes, a special tree or stone are determined as limit.

In the middle of 10 village is a samgrahanam.

In center of 200 grama is a Kharvatikam.

In center of 400 villages is a Dronamukham. And in center of 800 Grama is the Sthaaneeyam or main capital and all these should be well connected. At the limits of janapada there should be forts with protection or Kaappu (kaaval) and which open to nearby villages.

The intervals of these are protected by Vaagurika (those who make nets/fishing tribes) sabara, pulinda, chandala or the vanavaasi as the case may be.

For Rithwik, purohitha ,Guru,Srothriya land is given as Brahmadeya without tax. Give lands for Adhyaksha, Samkhyayaka (accountants), Gopan (chief of 10 tharavad or 5 grama) Sthanikan (the chief of 1/4th of the country) aneekastha (trainer of elephant army) chikitsaka (doctor) Asawadamaka (the trainer of war horses) jamghakarikan (one who runs with messages urgently) etc land without right for sale or giving to others .They can use it for their uses but have no right of krayavikraya.

For taxpayers the lands are own for Ekapurushika time (till one persons death) and if the successor is ready to do agriculture and improve upon it ,it is again given to the same family .If a land that was not cultivated is made cultivable ,that person should not be evicted from the land. The lands left uncultivated can be taken and given to people who are ready to cultivate. Or they can give that for the servants of the village or Vaidehaka (traders) for cultivation .Those who do not do farming should give a tax for leaving land fruitless. King has to give grains as seeds, cattle, and gold as loan to help start a agricultural operation. And give the people chance to repay back without any trouble .In natural calamity without affecting treasury king should give the people relief. King has to protect the people as a father.

It is duty of king to make the city limits protections, forests of dravya, forests of elephants, grazing grounds for cattle, the trade routes for commerce, the transport by water and land, markets and sathra etc. He has to provide a lake or chira with either sahodaka (rainwater storage) or aharyodaka (water stored artificially by canals of irrigation). The entire village gives land, way, wood, other instruments and service for such construction work. The fish, birds, plants in the lake belongs to king as representative of God.

In the country there should not be any sanyasin except a vanaprastha who has done all his grihastha and citizen duties. No sangha or group should exist except the entire gramasabha which is for the common good of entire village and act as a co-operative unit and as a guild .Except at prescribed times and periods of

festivals people who have duties should not waste time in hobbies etc. Only if people are interested in agriculture the treasury, granary, wealth, grains and fruits and its essences will increase and people will be healthy and happy.

The lands which are not usable for agriculture can be converted into grazing grounds for cattle. The Brahmaranya (for veda and its learning) for Brahmins, and Somaranya (for having plants for somayaga) thapovana (for thapaswins), a mrigavana or Rajavihara for the king are the forests to be protected. At the limits of land a sarvaathithimrigavana (forests for all types of plants and animals and having great biodiversity) should be protected.

If there is a need a monoculture forest for each wood can be cultivated also. There should be officers to protect them.

Hasthivanam need special protection and the one who kills an elephant is to be given death penalty. The elephant that dies naturally is property of king and its horn and nails belongs to king for trade or commerce.

The best elephants are seen in Kalinga, Anga, Chedi, Prachi, Karushakam. The intermediate types in Dasarnam, Aparantham, and the last (lowest grade) in Sourashtram and Panchanadam.

According to classification of Durga Kerala is having Anthardeepa, Nimlavarudha, Oudakadurga (or jaladurga) and with mountains and hills Parvathadurga. It also is a Vanadurga with lot of water, Cheru (or dirt) which is described as Khanjanodakam, and sthambagahanam (with several trees growing). Being a nadidurga, jaladurga and parvathadurga it is a protected space for people and no one from exterior can enter it easily. The vanadurga status is protective for people of the forests. And it is a special hiding place for all and gives a space for hidden guerilla warfare.

Sthaneeyadurga is always in a place where tributaries of rivers meet with a deep watery source which will never dry up, a lake etc and it should be in circle, square etc with water flowing all around (as Valabhi) and easy to bring things for trade and commerce and for food in emergency. Both land and water routes should have

approach to it. It should have three royal paths from east to west and three from north to south.

For each family around dwelling place flowering gardens, fruit gardens, trees without fruits or flowers and fields of grains should be cultivated by them and the produce from them stored and shared. For each 10 families at least one well should be there for water supply.

Each durgam should store in the granary materials needed for several years like:-ghee,oil,grains,salts,alkaline things, medical plants ,dry meat, ground grains, dry fruits ,nuts,grass,wood ,metals, skins and leather,coal,fibres,stones,bamboo,vaikalam as dress, the pith of trees,weapons,coverings,etc .Take the old ones for use and replace them with new ones so that there is always stock for an emergency.

Duties of a Samahartha:-

He is a supervisor of several departments of economical and financial importance and has to give information to his superior officer and he will give it in turn to the king. The samahartha has to look after the Karanneyam,sidham and sesham ,Aayam and Vyayam and Neevi of a number of departments like the Durgam,Rashtram,Khani,Sethu,vanam,vrajam,Aayasreeram,Aaya mukham,vyayasareeram,kaalam.

Karaneeyam :- Includes how much is to be collected ,from which desam is that to be collected, Determining its paths of transport and trade ,the actual collection methods, the total of all such collected wealth and articles, and the details of that.

Sidham:- Includes things deposited by people and chieftains in the treasury, and that which is collected by king directly from them, expenditure there from in the place itself, that which was balance to be collected in the previous year, that which was given by king as tax-free by deed, and by word of king,.

Sesham:- the total loan amounts to be obtained, the amount after expenditure for maintenance of army ,that which was not given to

king by help of the officials partiality, that which was not given by the principal or main kudi(villages),that which does not give returns ,that which has more expenditure and less gains .

Aayam:- That gain which repeats every day,that which repeats annually, and that which was under jurisprudence of previous Adhyaksha ,the fines ,increased tax in special circumstances, the sum given as relief for loss, that which was received from the enemy during wartime, that which came due to lack of heirs, treasures ,balance after a construction work, that which was not expended though allotted for a special cause, the gain after trade of things, amount obtained with sale of things which should not be sold, the amount which is obtained than the expected measures, the competitive unexpected increase in gain .

Vyayam:-daily expenditure, expenditure in a week, in a month, and annual expenditure.

Neevi:-From what was present earlier deduce both gain and loss and the balance is neevi.That is of two types .The expected and the actually gained/lost.

These are generally said .And of the departments in each of which he has to supervise these:-

1.Durgam.:- sulkam or amount of tax for products ,fine for frauds, the weight and measures, the tax collected by officers at the towns, by the superintends of lakshana(in a numismatic mine) , mudradhyaksha (for getting sign or symbol of entry from king),suradhyaksha (the supervisor for alcoholic drinks),for oil,flowers,for suthra,for ghee,alkaline things, for gold, for a market and shop, for a prostitution institution, for gambling, for construction, for the groups of kaarusilpi guilds (Karu does gross work and silpi does subtle work)and devathadhyaksha ,and at the door of city from external people to enter it.

Rashtram:- Sitha(for ploughing)for tax on produce of lands, Bali or voluntary deposits by honest men of the king, tax for trade , by the supervisor of waterways and landways,ship tax and boat tax,for

small and big towns,markets,for bounding a thief what the villagers give to king.

Khani :-Means mine.gold,silver,diamond,jewels,pearls,corals, conches,metals,salts,elements of earth, elements of water and Rasa etc

Sethu”:- Pushpavadam (flower gardens) fruit gardens, gardens (Shandam)with no fruits, fields of grains and other vegetables, the gardens for roots

Vanam:- for gavaya and cattle, for animals ,for dravya,for elephants etc.

Vrajam:-the village with cattle,buffalo,goats,small type goats, camel,horse,mules,is a vrajam

Aayasareeram:- the land and sea and river routes for trade and commerce

Aayamukham:- the gains at ports like the value ,part reserved for king, the competitive gains, the salary, the fixed tax, the increased tax ,the fines

Vyayasareeram:- for devapooja,pithrupooja,for giving alms,for swasthivachana,for expenditure of women and children in

Antha:pura,in kitchen, for messengers, for the granary, for weapons, for market maintenance ,for storage of the articles for trade, for expenditure on agriculture, for keeping a army ,for expenditure on cattle, and forest maintenance and grazing grounds etc.

Kaalam:- Rajavarsha or the number of years when a new king started the reign to assess the improvement or loss ,months, paksha,day,seasons and things available in each season,poorna and adhimasa .

Thus what the samahartha looks after is the entire economical condition of the area under his jurisdiction and it is a comprehensive function which our present collectors or ministers would find difficult to learn and control with efficiency.

Role of an Akshapatalaadyaksa:- He has to make an akshapatala with subdivisions up and below and record all the accounts on such

a graphical way and that is statistical work of high order which was maintained even in the time of Chanakya .The accountant keeps all the accounts in writing and with statistics for the future use .What are the things he has to write in a nibandhapusthaka (law book)? And how is it kept? There should be fixed place for each nibandhapusthaka.And there should be fixed place for each adhyaksha and his accountants to sit and work .(Called Upasthaana).They record:-

- 1.The number of Adhikarana where each dravya is seen and where it originated
- 2.The prachara (place where it is collected)in each adhikarana.
- 3.Sanjatha (the amount to be collected or expected from each)
- 4.In dravyaprayoga ,their growth,loss,expenditure ,origin, associations ,place,salary,adding of impurities by traders, and their pramana.
- 5.About jewels, diamonds and valuable things of trade their value, qualities of color etc,weights and measures, value for each measure and the jewellery
- 6.About grama,kula,jathy,samghataha etc their dharma, vyavahara, charithra or history,samsthaana(how to preserve their place of antiquity),and their present status.
- 7.About royal servants their customs,duties,place of origin, and salary, their tax-free wealth if any, the rice given to them for daily food,
- 8.About king ,queen and their children:- Their jewellery,their lands, their special expenditures, the things to be given in special occasions, their expenditure for health matters,
- 9.For the friendly king:- The wealth as gift to be given by the treaty of friendship
- 10.In the case of enemy king when won over in war how much gift and wealth was decided to be given and how much was actually given etc.

It is from this the karaneeyam,sidham,sesham,aayam, vyayam, neevi,upasthanam (time of examination of each),and place of

collection, charithram and custom, and the past state and the present state are recorded into a book and kept.

For a professional year there are only 354 days and 12 days are holidays for royal servants. Each adhyaksha has several assistants of service class who are honest people. The official groups reach their respective Akshapatala in the month of Ashada. They come with the sealed grantha groups and the neevi (balance sheet) and remain in the place of account keeping without going out and keeping perfect silence and concentration. Hear the gain and loss and decide the tax to be collected and collect it then and there. If an adhyaksha fails in his duty he has to pay fine. Similarly for accountant also there is fine if he does not turn up when the adhyaksha has fixed a date for inspection. The calculations of people, of accountants and of adhyaksha are compared by the impartial Mahamathra Brahmanas and tell the king the details when all are present. The one who has done any fraud will be given a fine.

Economy of the nation:-

The growth of production (pracharasamridhi) of a nation depends on the charithranugraha (protection of past historical dharma and blessings there from), choranigraha (lack of thieves), Yuktha prathisheda (lack of corruption among the adhyaksha and officials), sasyasampathi (more produce from plants / agricultural products), Vanijyavidhi (increase in trade and commerce of such produce), lack of debts, the tax which was avoided due to certain circumstances being given back when a good time comes (voluntarily by people / or by force by king), the gifts from other kings and rich men and traders to kings. These increase the amount in the king's treasury.

Corruption, lack of honesty and truth among citizens, evading tax, extra loss by luxurious expenditure by people, lack of production and lack of industriousness leads to loss and treasury is weakened. If an official does corruption the people have freedom to tell that in

public in their sabha and samithy so that fine can be taken from such officials. Before giving post of a responsible official or minister they have to undergo severe tests of honesty by people and the king .Not only of the knowledge of that particular field of activity but of honesty, dharma and of goal of common welfare. The election was thus not just on majority votes on which corruption is possible in the present set up. A saasanam means a order that is written or recorded (lekhyartham)and for writing an order a person who is well qualified is selected.Vachika sasana is order by word and pathraka is by writing and among this patharaka alone deserves as a record .They are pragnaapana(vignaapana), Agna ,paridaana(or prasasthi with praise)parihara(when king or rich person give a land or wealth to temple/town/grama/or to some special kula/race etc)nirrushty(which gives representation through another person),pravrithikam(description of pravrithy or functions of divine, human types factually happened as a historical account) ,prathilekham(after studying the lekham writing a fit reply) ,sarvathragalekham(which is written by emperor or king for all to do protection for all written to all chieftains and Lords and subordinates)

Of the 10 types of pearls Chanakya describe 6 are from Kerala and west coast .(Kerala especially from malayaparvatha and its rivers) and one from Pataliputhra and one from Himalaya ,.They are Pandyakavataka,Tamraparnika,Kouleyam,Chourneyam,Mahendram,Pasikyam ,Haimavatham etc. The emeralds called Koutam and Maleyakam are from Kerala.16 types of sandalwood are described of which three belong to Kaamaroopa(Assam)and the rest to Malayaparvatha (again Kerala /Karnataka).About Karpaasa he says the best are from

Madhura,Konkana(Aparantha),Kalinga,Kasi,Vanga,Valsa or Kousambi,Mahishmathy the palace of Kunthala or Karnatakadesa.

15th chapter deals with duties of a Adhyaksha of Koshtaagaara or storage granary. He should know about :-

Seetha,Rashtra,Krayima,Parivarthaka,Pramithyaka,Aapamithyaka, Simhanika,Anyajaatham,Vyayapratyayam,and upasthaanam.

Seetha:- that different types of grains which are brought by a Seethadhyaksha is called Seetha.

Rashtra is the agricultural revenue like:- the tax for entire village(Pindakaram),The 1/6th of produce(Shadbhaaga),the expenditure for army(Senabhaktham),The receipt as bhiksha (bhikshabhaktham/or Bali), tax on tree (karam),Utsangham (special things/gifts or poli during special occasions like festivals),parswam(increased tax in special contexts), paarihinekam(the fine for destruction of common property by cattle etc),oupayanikam(that which is given as Adiyara by a defected king),Koushteyakam(water tax).

Krayimam:- the value of grains, the paddy or grain that was brought with cash, the balance after all the krayavikraya

Parivarthakam:- The bartered grains by giving excess grains grown in one part of land to other part of land

Pramityakam:-the grain that was got by request

Aapamityakam:-if it is on a loan basis it is aapamityakam

Simhanika:- the profession tax for kuttakam(for removing husk of grain in a mortar)rochaka(for taking out the seed),for Sakthu (grinding to a powder),suktham(making a liquid from it)pishtam (wet grinding),for each of the professionals for such processing.For making oil from Ourabra or thailika and also from people with a wheel (chakrika)for it and for making sarkkara or gulam from sugarcane.

Anyajaatham:- that which is got by chance ,or by someone's forgetfulness.

Vyayapratyayam:- After expenditure for constructive purposes ,and expenditure of army

Upasthaanam:-Thulaaamanantharam(the difference between weight and measure when something is taken and given)

Hasthapooranam(that which is excess when the measurement is

with full hand),ulkaram⁹after measurement what is obtained when we sweep the floor,Vyaji($1/16^{\text{th}}$ of all measured) ,paryushitham (balance of last year),prarjitham(gain by the efficiency of the Adhyaksha)

Dhanyakalpa is to be known by Seethadhyaksha.

Snehavarga is ghee,oils,vasa and majja.

Ksharavarga is khandasarkkara(Phanitham) gulam,sarkara called Matsyandika,kalkandam

Lavanavarga are saindhavam(Hinduppu),saamudram(Uppu obtained by Marakkalam or ship)

Vidam(Vilayuppu),yavaksharam(Chavalkaaram),souvarchalam(thu varchila uppu)udbhedajam (uvaruppu)are salts.

Madhuvarga are honey and grapevine.

Aasavam or sukthavargam :- Take one of the following as sugarjuice,gulam,madhu,phaanitham(sarkarappavu or neersarkara), jambavam(juice of Njaval fruit),juice of jackfruit,.Add to the kashaya of Meshasringhi and root of Forest thippali .Keep for one month,six months or one year.Into it add the grind chidbhida fruit(Aanamodakkaya or elephant fruit),urvaruka(forest vellari) ,stem of sugarcane, mango and nellikka(amalaki).

Phalamlavargam (acidic fruits):- Marappuli or Vrikshamlam ,karamardam fruit,mango,vidalam (thalimathalam), nellikka, mathalanaarakam,kolam,badari(small Ilanthai),souveerakam(big Ilanthai),parushaka fruit.

Dravamlavarga are curd and dhanyamla or Kaadi given for cattle etc

Kaduvargam:-

thippli,pepper,chukku,ayamodakam,jeeraka,kirathathiktham(puthar ichunda),gourasarshapam(whitemustard),kasthambaru(kothampaal ari),chorakam(channaroots),damanakam(uluva),maruvakam,sigruk andam(root of Muringa).These are spices.

Saakavargam:- dry fish,dry meat,roots,tubers,fruits etc .people who live by eating them (in places where there is no other food)are the saaka people. (See origin of Saka and Sakya kings)

Half of That which is stored in the koshtagara like this is for the people to use during natural calamities ,famines etc.The other half can be used for day to day use. The old has to be used and replaced with new .

When varaku and paddy are removed of its husk its weight decrease to $1/2$.The red paddy reduce by $1/8^{\text{th}}$.Varaka(grass and chaama) gat $1/3^{\text{rd}}$ less of rice. For priyangu (thina) $1/2$ paddy and $1/9^{\text{th}}$ multiplication is obtained. For udaraka red rice same as thina.For yava and wheat if wet grinded equal rice is seen. Ellu (sesame),yavam,cherupayar(Bengal gram) uzhunnu (gram)etc when grind has equal rice.($1/2$ and its $1/5^{\text{th}}$).

When millets are cooked we get three times its quantity of food. For rice it is 4 times and for red rice 5 times quantity.

Thimitham(wet and degenerated rice)and aparannam(the immature paddy)will give twice its quantity only .For sprouted rice it is $2\frac{1}{2}$ increase in quantity.

Oils:- for Athasi seed $1/6^{\text{th}}$,for seed of veppu,mango seed and kapitham $1/5^{\text{th}}$,for sesame ,kayumbu ,irippa,odayari $1/4$ oil.

For karpasam (cotton)for 5 palam one palam thread is obtained and so is for wool.

Food of elephants:- 5 dronam(20 Adakam or para) paddy ---12 adakam rice .That is needed for a infant elephant.

For big elephants(Vyala) for 20 adakam paddy 11 adakam rice is needed.

For Oupavahya(elephants with pattam) 10 adakam.

For war elephants 9 adakam each

For infantry 8 adakam

For commanders 7 adakam

For devi and for kumara of the royal family 6 adakam

For kings 5 adakam

This should be given without cut rice(muriyari/podiyari less).

The measure of food for a noble man or Arya is:- one idangazhi rice, $1/4^{\text{th}}$ of it dhal, $1/16^{\text{th}}$ of dhal is salt, $1/4^{\text{th}}$ of dhal is oil/ghee .(This is called an Aryabhaktham).

For others one idanghazhi rice, $1/6^{\text{th}}$ dhal, $1/2$ of dhal oil/ghee.

For women reduce $1/4^{\text{th}}$ of it and for children reduce $1/2$ of it.

Oxen need one dronam Bengal gram or cooked yava kanji and the rest of the food is same for horse and oxen. One thulam granapinyaakam(pinnakku) and 10 adakam kanakundakam(with bran and split rice)is to be given for cattle.

Dogs need one idangazhi rice. Birds need $1/2$ idangazhi rice.

The carbon, wood and husk can be sent for artisans to do their work, and for construction work .The podiyari and broken rice is useful for kanji and for other purposes of cooking.

All instruments like Thulamanabhandam(things for weighing and measuring),rochani(the grinding machine),drishath(the stone for grinding –ammi and kusha-pestle and mortar), musalam, ulookalam,kuttakayantharm,rochakayanthram,pathrakam,soorpam, chalanika for filtering,kandoli or baskets,pitakam or boxes and containers,sammarjani or broom, etc are all his responsibility to be collected for needs.

He has assistants like marjaka(cleaners,sweepers),rakshaka (protectors/as army? police),dharaka(who measure with weights),mayaka (who takes other measurements),maapaka(those who supervise such measurements),daayakaa(who gives),daapaka(who supervise the giving),salaakapratigrahaka(kolkar or assistants of a tax collector),daasa(servants) karmakara(all professional in all jobs).These official servants are called the vishty .The grains have to be kept in a high place,kshara in a closed pot/basket,oil in a bottle or a ghata ,and salt can be put in the floor itself.

Panyadhyaksha:-

Should know the objects that come by land route and by waterways and the value of each and its differences and also where it is most liked and not needed (markets for each).The vikshepa (marketing in the region),samkshepa(collection at one place) krayavikraya (selling and buying) and its practical times should be known. The things which are regionally available can be done in one place itself.(Ekamukha).But that which has come from other region should be sold in several places so that all people get benefit of it. Even if great gain is expected ,should not resort to selling that

creates difficulty for people and such practices by all should be prevented for welfare of all.

Kings share is $1/16^{\text{th}}$ of things that are measured .And $1/20^{\text{th}}$ of that which is measured by weight as Thulamanam .And for counting $1/11^{\text{th}}$ is for King.

(This mean if 16 para rice is there one is for king. If 20 pound sugar is weighed 1 pound is for king. If 11 gourds are counted one goes to king).

Those who go for trade in waterways should know the yaaanabhatakam(the amount for unburdening the things to ship),pathyadanam(the type of food to be taken along with),comparison of the objects to be bartered at such long distance places.Kupyadhyaksha has to collect them from the protectors of wealth of forests, bring them and administer the supervision of all the activities related to them and give salary and food etc for the forest tribes.

Kupyavarga means the trees and other forest products etc (35^{th} prakarana) .

Their classification in 17^{th} chapter is as follows:-

Kupyavarga are classified as saaradhaaruvarga(trees with pith), venuvarga,vallivarga,valkavarga,pathra,oushada,sthavaravisha,vish a,mriga,loha,and other things.

Saaradhaaruvarga:- .

- 1.Saakam /Teak
- 2.thinisam/nimi
- 3Dhanuanam /vilmaram
- 4.arjuan(Maruthu)
- 5.madhookam(irippa)
- 6Thilakam(manchadi)
- 7Saalam(mural)
- 8Simsapa(irumullu)
- 9Arimedam(karingotta)
- 10Rajadanam(pazhamunpaala)

- 11Sireesham(Vaaka)
- 12Khadiram(karingali)
- 13Saralam(charalu)
- 14Thalam(karimpana)
- 15Sarjam(paine)
- 16Aswakarnam (venpayin)
- 17Somavalkam(venkaringali)
- 18Kosamram(vaarmavu)
- 19Priyakam(venga)
- 20Dhavakam(njama)

Venuvargam (bamboos):-

udajam, chimiyam, chaapam, venu, vansam, saathinam, kandakam, bha llukam.

Vallivargam(tendrils):-

Vethram(choral), seekavally(hansavally)vaaasi (a valli with flowers similar to flower of maruthu), syamavalli(which is similar to Thrikolpakonna) naagajihua or naagalatha etc

Valkavarga :-

malathy(Mahuvaalani), moorva(marul)arkam(erukku), sanam(chana), gavedhukam(naagabala), athasi(akazhi)

Rajjubhandam:- Munja grass, Balbajathrina etc

Pathram:- thali(kodappana palmyra), thalam(karimpana), bhoorjam .

Pushpam:- Kimsukam(plasu), Kusubham(kusubam), kumkumam.

Oushadis includes all roots, tubers and fruits as well.

Stahvaravisha:-

kaalakoota, valsanabaha, halahala, meshasringa, mustha, kushta, maha visha, vellithaka, gourardra, baalaka, markata, haimavatham, kaalinga kam, daaradakam, ankolasarakam, oushtakam.

Vishavarga:-sarpa, keeta and their poison taken and processed and kept in kumbha(called kumbagatha).

Mriga:- Godha(reptiles),seraka(a variety of it),dweepi(small leopard),Riksham(bear),Simsumarm(crocodile),simaha (lion),Vyaghra (tiger),Elephant,buffalo,chamara(kavariman ,a type of deer),Srimari(deer with 8 ft),Ghadga(Vaal deer),gomriga (murasu),Gavaya(forest cow),And all animal products like skin,bone,horn,snayu, pitham, teeth,nails,tail etc

Loha:- kaalaayasam (black iron),thamra(brass),vritham,Kamsyam,seesam,thrapu (white lead),vaikrunthakam ,aarakootam (pichala).

The different types of containers which are woven and with clay and other materials with different volumes and measures should be available for collection of all materials and storage. Even the carbon,thussha(bran and husk of grain),bhasma(ashes) and the excreta of animals and birds are useful in various ways and should be made use of .(They knew how to recycle the waste materials effectively by organic farming etc).

Thulaamaanapouthavam :-

It is duty of adhyaksha of pouthava to have all instruments for weighing and balancing etc and to make them in sufficient amounts and store them. The metric of measuring and weighing has been in Indus valley civilization onwards and it was the best in the world at that distant period as certified by all archeologists and historians. The measuring system of Arthasasthra is only a continuation of it.

The word Pouthava means sodhana or measure of a measure or testing the measurement and its instruments. It is from the word Patham which is a measure of paddy in Malayalam which stands for a Padam or 1/4th in Sanskrit. It is interesting that Koutilya use the term Pouthavam and not Poudavam(That is a south Indian word is used).

Measuring gold:-

10 dhanyamasham(seeds of Bengal gram)	=1 suvarnamasham
5 Kunni(Gunaja)seeds	=1 suvarnamasham
16 suvarnamasham	=1 suvarnam or Karsham

4 suvarnam(karsham) =1 Palam
 $\frac{1}{2}$ masham/1 masham/2masham/4masham/8masham/1suvarnam/2
 suvarnam/4suavarnam/8suvarnam/10
 suvarnam/20suvarnam/30suvarnam/40suvarnam/100suvarnam in
 that order are the weights of gold.

$\frac{1}{2}$ $\frac{1}{2}$
 1
 1 1
 1 1 1 1
 1 1 1 1 1 1 1 1 1 1 + 1 1 1 1 1 1 1 1 = © = one gold
 coin Suvarnam.

©© = 32
 ©©©© = 64
 ∞ ©© = Fishsign 1 128+32 =160
 ∞∞©©©© =fishsign 11 256+64 =320

∞∞∞©©©©©©© =fishsign 111 386+96=482
 ∞∞∞∞∞∞ =fishsign 1 V 640

Fishsign v ($\frac{1}{2}$ of 100) 690

A vessel that contain 100 gold coins or suvarnam can contain
 16000 grains in it and 8000 seeds of Kunni or gunjum(Abrus
 precatorius).Thus the volume of the vessel also is measured.

Measuring silver :- 88 gourasarshapa (small mustard)=1
 rupyamasham

16 rupyamasham=20 Shaibyam (seeds of Manchadi)=1 dharanam.
 $\frac{1}{2}$ dharanam,1 dharanam,2 dharanam,4 dharanam ,8 dharanam ,10
 dharanam,20 dharanam,30 dharanam,40 dharanam,100 dharanam
 is the measure of Rajatham or silver.

For a diamond ,20 paddy seed is one vajradharanam.

Prathimaana or balance construction:-

The prathimana is the two steps on which the object is placed .It is made with either the iron,or the stone seen in Magadha and Mekhala.Any object that will not be wetted by water, and which will not get dirt adhered to it to increase its weight ,and which will not get reduced weight with heat can be used. Conch etc could be used to make it.

The measuring kol or thulakkol:- starting from 6 inches with 8 inch each length, and from one pala to each increasing one palam iron make 10 thulakkol .For each of these at the end of the instrument (either on either side or one side only)there should be a Sikyam (Thattu).

With 6 “ length one palam iron one,14”length 2 palam iron one,22 “length 3 palam iron one in this way the 10th kol will have 78 “length and 10 palam iron.

The common balance used is with 72” (3 muzham)length and 35 palam iron. This is called a samavritha balance .At its lower end with 5 palam iron a mandalam is made (vritham)and by alone make a samakaranam or balancing for test. From it towards the upward direction, from karsha to pala (karsha,1/2 pala,3/4 pala, pala etc),and then 12 pala,15pala,20 pala,like that draw lines (as a scale)for the weights. From 20 to 100 .have 10 each above .In each five (aksha is the multiples of 5)put a Nadhri or a Nandi (sign of swasthika).

Twice that is said (70 palam) iron and 96 “length (4 muzham)is called Paarimaani (irattithulakkol).On that above sathapada(100) pala line 20,50, and 100 lines are drawn.

20 thulam =I Bhaaram,(weight)

For other things other than gold do as follows:-

10 dharanam =1 palam

100 palam = Aayamaani is a thulkkol for weighing aayam.

The balance 5 palam less from aayamaani is (95 palam) a vyavahariki which is used in usual krayavikriya.

Less than that (5 palam) about 90 palam is a Bhajani for weighing measures for the workers.

Less than that (85 palam) is for weighing and giving things to the queens palace.

For vyavahariki etc for ardhadharanam (10 kanam)less is palam.2 palam less is utharaloha (iron to make it).6 “ less is length also.

For Paarimani and Ayamani when weighing things other than meat,metal,salt and jewels ,put 5 palam of prayaamam (excess) for thulam.

Kashtathula:-The wooden balance. Length is 8 hastham with padam and with hard stones as prathimana,and fixed on Mayurapada(pillars with shape of peacock).

Volumetry:- 200 palam bengalgram is the Drona Aayamaana.

187 ½ palam is Dronam that is vyavaharika

175 palam is bhajaneeya Dronam

162 ½ palam is for Anthapura:bhajaneeyam (queens quota).

1/4th of drona =Aadakam(Para)

1/4th pf Aadakam= prastham(idangazhi)(For conversion to litre see part on Susruthasamhitha)

1/4th of prastham =Kudumbam(Nazhi)

16 dronam = Vaari (Khaari)

20 dronam= kumbham

10 kumbham =vaham

There is something called Naaraaayanaazhi or Maanam .It is made of dry wood with pith, and with sama on either side(equal on base and top)and which keeps 1/4th of the measured thing as a sikha or with a sikha inside for measuring ghee ,oil etc.For measurement of essence of ghee and oil this is needed with a antha:sikha .

For measuring alcohol,flowers,fruits ,husk,carbon,Sudha (kummayam for whitewash) etc sikhamanam is twice that of ghee and oil.

For the Drona cost is 1 ¼ panam.

Cost of Adakam is $\frac{3}{4}$ panam

For prastham 6 mashakam

For kudumba 1 mashakam.

For measuring jars of the Rasa (ghee etc) the cost is double.

For prathimana (with 14 padi) cost is total 20 panam. $\frac{3}{4}$ th of it is cost of thulaakkol. For 3 palam kol one panam. Like that to be calculated.

Every 4 months weights and measures have to be checked and tested. If they are not submitted for inspection fine of $27 \frac{1}{4}$ panam. The salary for testing for the Pouthavadhyaksha is one kaakani ($\frac{1}{4}$ masham) per day. for ghee $\frac{1}{32}$ is the vaasi for clarifying it. For oil it is $\frac{1}{64}$ part. For all liquids $\frac{1}{50}$ parts of loss by measuring has to be allowed. This is for king.

The other measuring jars are Kudubardham(Uri)

Kudubachathurbhaga(Ozhakku) kudubhashtabhaga(aazhakku). $\frac{84}{100}$ kudubam (kudavam) oil is Thailavaarakam. Its $\frac{1}{4}$ th is

Ghrithaghatika and Thailaghatika.

For giving salary:- every 30 days for all officials except following 32 days for army personnel(Balamasam)

35 days(Aswavahamasam) for people looking after horses

40 days is Hasthivahamaasa for people looking after elephants .

Seethadhyakshan:-

He is in charge of all agricultural operations in each regions. He should know all methods of agriculture ,Sulbasasthra(measuring land),Vrikshayurveda for treating diseases of all plant life. He should know how to plant, nurture and protect trees and plants. All grains,fruits,flowers,saaka,spices ,roots,tubers,leafs ,grasses, tendrils,wool,silk,cotton,etc should be grown and collected in time. The seeds should be sown in the land that was ploughed several times .He can use relatives,friends,servants ,or even prisoners to work in the fields. The karshanayanthra(machinery for krishi) cattle etc should be made available by the artisans like karmaran

(karuvan) kattakan(assari),medakan(basket weaver),rajjuvarthakan (who makes coirs),sarpagraham etc .

Jangaladesa is a place where water is less and gets only 16 dronam rain annually(Varshapramana).Anupadesa is watery lowlying areas and even with half of that rainfall it gets good produce.

The rain needed for the different places in India”:-

Asmakadesa(Aarataka) 13 ½ dronam

Avanthy(Malawa) 23 dronam

Aparantha (Konkanam) amitham or without end lot of rainfall

Haimanya (Himalayan areas)has to get the water from ice to do agriculture

Kulyaavaapa has to get irrigated water from canals .In these two places we need not measure rainfall. When the good season come just sow.

The 1/3rd of rain that is needed if we get in east and west months (the end and beginning of rainy season or sravana,karthika months) and in the two months of proshtapada and Aswayuja means Sushama (good annual seasonal rainfall).This good rain is predictable by position of Jupiter, its samkramam into a raasi,by conception time(wind and thunder and clouds in the earthly sign) ,by rise of Venus,its setting,charam(journey)etc and by nature and difference in nature observed in sun,(parivesha etc).From sun the plants get seed .From Jupiter the sprouting of stem and first tender leaves. From venus is the rain .(When venus is in the nine thithi of ashadam starting from panchami)

Look at the nature of rain.

- 1.That which rains for 7 days X 3
- 2.Thin drops for 80 days
- 3.Mild for 60

These are samavrishty.

If heat ,wind etc are there and rain comes intermittent so that a piece of cowdung is dried three times it is a kareesha.And that is less rain sign. Seeing this sign sow the appropriate seed .

Grains to be sown at the beginning of rainy seasons:-saali(red rice),vrihi(rice),kodravam(varaku),thilam(sesame)priyamghu(thina),udarakam(neduvarku),varakam (small variety).

To be sown at middle of rainy period:- mulgam,masham,saibhyam

To be sown at end of rain:-

kusubham,masuram,kulatham(muthira),yavam,gothamba or wheat,kalaaayam(vattachaana)athasi,sarshapa(mustard).

Look at the season and sow the best seed

The area that is not sown by the Seethaadyaksha of the village is cultivated by the ardhaseethika (who work for ½ share)or by swakaryopajeevi(people who do only manual service and who have 1/4th or 1/5th of share of the produce).Whoever has taken the land for cultivation has to do cultivation .And if they do not do so, except in a situation which is beyond their control, they have to give the tax share that is due to the King. So ,all should cultivate on land available and none is allowed to leave it as wasteland.

If the irrigation facility is provided for cultivation,1/5th is the Udakabhagam (water tax)for King. If it is by kaalathekku(by oxen)1/4th is udakabhaga.If it is srothoyanthra irrigation the water tax is 1/3rd produce. From river,lake,well etc irrigation tax is 1/4th produce.

(This is because the real master of the land and water is God and king is only God's servant .King looks after the affairs as representative of God. The other objects on the land is property of the Kudumbi or householders who do cultivation of land .Therefore land tax and water tax is due to God through King -as salary of King or rent of land and water.).

Depending upon quantity of water needed for each type of crop and type of land ,the Seethaadyaksha make them sow the suitable seed/plant in suitable land/field (Like kedaram or field,Kaimanam or seeds to be sown in hemantha rithu and in Himavan,graishmika or seeds sown in Greeshma etc)

Among agricultural produce Saali(red paddy) and other varieties of paddy are the best(Uthama).Shandam(Gardens)is Madhyama

where one can grow other plants like plantains and fruit trees. The adhama krishi is that of sugarcane since it requires more cost and can have several risks. For plants with fruits on tendrils (Valliphala) the best environment is Phenaaghaatham (Surrounded by water and foam). For thippali, grapevine and sugarcane best is parivaahaantha (canal irrigated land at periphery). For roots and tubers well irrigation is enough. (Koopaparyantha). For Hareethaka (grass) places near canals and water sources (Harineeparyantha) and for Lava (which is plucked plants), Gandhadravya (fragrant plants) < Bhaishajya (medical herbs), ramacha grass, Iruveli and Pindalukam (colocasia) paaali (paali or paaleeya means near small canals where there is always water). Both sthalya (garden grown – in parambu) and anupya (grown in fields in sea level with lot of water) medicinal herbs should be cultivated by all in their lands. For seeds of grains 7 days thusharapaayana (allowing to get snow) and ushnasodhana (drying in sunlight) is needed. For Koseedhanya (which is sprouted in a sack or a granary) three or 5 days is needed. Kandabheeja (which is planted by cut stems) the cut end should be smeared with honey, ghee, cowdung and swinevasa before planting. For roots and tubers smear honey and ghee on them. The Asthibheeja which are sprouting from bones (Paruthikotta, a food for cattle) smear with cowdung. For branching trees the pit (garthadaaham) is first prepared by burned bone powder and cowdung as fertilizer. For all, in time, add fertilizers (douhridam) when they are about to bear flower and fruit. When plants sprout and the first leaves appear dry small fish in milk of cactus is sprinkled over it to prevent worm infestation of the plant. To prevent snakes, mix the Paruthikuru and skin (ura) which a snake has discarded and make a smoke. No snake will come near if this smoke is there. All seeds before they are sown is put in water with a piece of gold, and a handful of the seed is wetted in it and then sown. When we sow utter the mantra Prajaapathaye Kaaasyapaaya devaaya cha Nama: Sadaa Seethaa me ridhyathaam devi beejeshu cha dhaneshu cha.

(This is probably because it was Kasyapa who first made agriculture popular in Kerala according to Parasurama story) Each of the officers like Shandapaalaka(garden protectors), vaadapaalaka (forest protectors), gopaalaka(cow protectors), daasa(service people), karmakara(the people who do all jobs) should be given Bhaktham(food) according to purushaparivaapam (the function and exercise done). Apart from that they should be given 1 ¼ panam salary per month. For kaaru (artisans) also the food and salary is given depending upon the job they do.

The fruits and flowers which fall by itself is for Devakarya. Paddy and yava which fall down is for Agrahayana, and for Srothreeya and Thapaswins. Raasimoolyam(the grain which falls down from a bundle of paddy which is taken from field to storage place) is for Unchavrithy(The thapaswins who live with bhiksha food).

When the grain is fully mature, immediately take it to storage place. Do not keep it there even for a single day more. Not even the hay should be left in the field. The hay is made into a heap or a raised platform. They should not touch each other and a weight is placed above. In a kalam (where the grains are taken) around a mandala (a circle where the oxen are used to make the harvested grain to be separated from the stalk –a ancient methiyanthra which makes a circular pit by walking of oxen around). Prevent fire and water (wetting) and for that service class should be cautious.

45th prakarana 20th chapter is on the Naavadhyaksha who is in charge of the Naavika or waterways which include ocean, rivers and ports, and natural lakes(devasaras) and visaras(artificial manmade lakes). Kerala being a land of ocean, large number of devasaras, and rivers was a special place for the transport of things by waterways. How to deal with small and big boats and ships from other places and how to get tax from them for transport and for trade and commerce etc are given in that chapter. Since it is not pertaining to agriculture proper I am not giving details here. But agricultural products and medicinal products of kerala found its trade and commerce routes through waterways into outside world

and to inland by the three natural routes to inland (Aruvamozi in southern end, Palghat pass in middle (Naduva churam/Neduva) and the northern Wynad pass is a historical fact and geographically this cannot be denied either and the three branches of Kings of Kerala were in these three areas having close links with each other by marriages and helping each other in emergency situations (The middle part being sovereign and the north branch the yuvaraja and the southern branch the 3rd or thekkilamkor) just as the Chola, Pandya and Chera kings were doing in the past .

Goraksha:- Krishi and Goraksha are inseparable for a vaisya. Therefore Godhyaksha is working along with a Seethadhyaksha .He does supervision of vethanopagrahika, karaprathikara, Bhagnolsrishtaka, Bhaagaanupravishtaka, Vrajaparyagra, nashta, vina shta and ksheeragrithasanjaatha.

Vethanopagrahikam:- Giving salary for looking after the cattle. Each of the Gopalaka (protector of cow/cattle), pindaraka (one who takes them to graze), dohaka (one who milks it), manthaka (who churns curd), lubdhaka (who chases away carnivores in forests to protect cows) should have 100 cows/cattle each under them for protection and they should be given salary in money ,and not in cattle or in milk and ghee. If we fix it as cattle, milk or ghee they will kill or exploit the animal for more milk and ghee (excess milking not giving to calf) .

Karaprathikaram: There will be vridhapasu, (old cattle), Dhenu (milking cow), garbhini (pregnant cow), Pashtouhi (cow which needs a mate to reproduce), valsathari (calf which has stopped drinking mothers milk) etc .The hundred cows given to each of the above people should have equal number belonging to each of these category .The person who is given 100 cows of this samavibhaga is expected to give to the king a tax in kind .8 vaarakam (1 vaarakam being 84 kudavam or kudumbam 8 vaarakam is 672 kudavam) ghee ,one panam per cow (called pucham because it is counted per pucha or tail of a cow),and if a cow dies the Ankacharma (the skin of dead cow for making musical instruments etc .It is ankacharma because the skin of the cow has a rajamudra or mark which is

given when it is alive) is the annual tax for king. The Ghee he can give on a daily basis so that by 365 day ,it is spread as a small amount of his total produce and does not affect his economy.(See Chilappathikaram for the same system that did existed in Pandyadesa where Mathari gives ghee to royal palace daily).

Bhagnolsrishtaka:-diseased,and lame ,the cows which does not allow any other person except the familiar person to milk it,the cow which is difficult to be milked ,cows which have no live calf etc are given in equal numbers (total 100) to the people who are having cows as before. From this they need give either $1/2$., $1/3$, $1/4$ etc depending upon the gain to king. This can be variable.

Bhaganupravishtakam:- sometimes cows from another region (belonging to another king)might join the cowherd by loosing way or by running away from cruel animals in forest and they will have a different sign (from that king on skin)The Gorakshaka has to protect them also and from the gain from it $1/10$ has to be given to the king.

Adhyaksha has to make a census of all the cattle in the village and write it in a Nibandhapushthaka .This recorded census of cattle is called Vrajaparyagram (Vrajaganitham).He has to write the lakshana of each group of cattle and write their number as given below.

Census of cattle according to lakshana:-

- 1.Valsa calf that drink mother cows milk
- 2.Valsathara Which has stopped drinking mothers milk but are not fully matured
- 3.Damya which can be used for ploughing
- 4.vaahi which can be used for carrying burden
- 5.Vrisha which can be used for reproduction and as a seed giver for cross breeds (young reproductive)
- 6.Uksha The oldest Eruthu (Temple ox) as seen in Indus valley seals.
- 7.Yugavaahanasakatavaahaka: which can be yoked as a pair to vehicles and to ploughs

- 8.Vrishabha (The young reproductive male of a buffalo race) Manippothu.
 - 9.Soonamahisha which are only muscular buffaloes for games etc
 - 10.prishtaskandavaahi: Mahisha for carrying burden on shoulders
 - 11.Valsika:- with calf(both cows and buffaloes) to be separately recorded
 - 12 .Valsathari :-in both cow and buffalo separate record
 - 13.Pashtouhi in each variety
 - 14.garbhini in each variety
 - 15.Dhenu in each variety
 - 16.Aprajatha which has not yet delivered in each variety
 - 17.vandhya which has no children even after repeated attempts
- Between 1-2 months of birth the valsa,valsika are called upaja and at that time they are given an ankha (Ankh) as Rajamudra on skin. This Ankha (for the ownership)along with natural Chihna(signs) on its body and on which organ which side etc(birthmarks) varna (colour marks whether uniform,partial,on one organ,symmetrical, etc etc)Sringantharam(the interval between the two horns) etc are measured and recorded in the census book. All these were recorded in a cattle census.

Nashtam:-Those cows which were taken by thieves,those who ran away to join another kings cattleherd,those lost in forest (avaleenam) are nashta or loss and that is to be recorded

Vinashtam:- If cattle die in a cher (pit of mud)or accidentally falling from a high place(mountainous tract),or if they are lost by natural death following disease ,or by loss in a waterbody (during floods etc)or by ingesting some poisonous material while grazing or from food given by mistake, or by Isaana(lightning) or by fury of animals like big elephants, crocodiles or serpents (python)etc it is vinashta .Gopala have to be careful to reduce vinashta and if it happen because of their carelessness they are liable to pay a fine. Those who kill a cow/cattle ,those who make others do the killing, those who steal cattle and those who make others steal cattle are

having mrithyudanda (liable to get capital punishment). Those who put kings mudra or Ankh on others animals, has to pay penalty. Gopalaka has to do service of all cattle including old, young, having disease and lame alike without any partiality and all should be looked after alike, as the king do his subjects as own children. According to seasonal availability of grass and water, and according to the security of cows and cattle they will have to wander and live. For avoiding the forest animals, serpents, to know the way of the lost cow and for reducing fear of cows a ghandaamani (bell) is tied on the neck of cows. The cattle should be given water from a river, lake or tank which is equal, broad, and with a place for them to get into (A ghattam or a Kadavu) and where there is no dirt that pulls them down and where there are no crocodiles. When by accident or by natural reasons a cattle die immediately its owner should tell the Adhyaksha so that it is entered in the respective column of census. If they fail to inform, when a test counting is done in next period, they will have to give fine for the lost cattle.

When an animal die its owner asks the Paraya or chandaala to skin it and give the organs which have to be given to the Goadhyaksha. These include the hairy skin, the urinary bladder, Pitham (Gall bladder) snayu, teeth, nails (kulampu) or hoof, horns, bones etc. Especially important were the skin of cow and buffalo, the ear signs of the goat and small goat, the tail, skin etc of horse, ass and camel to be given to Goadhyaksha for various purposes (To make instruments and for various medical purposes). This also ensured that the owner cannot say a lie that such and such an animal is dead.

Whey is to be given for swines and for dogs. Its koorchika (paada or that which is on surface of whey) is to be added to food of the army personnel. Kiladam (curd that is damaged) should go to wet the dry pinnaakku or cattle feed. The meat of a dead animal can be used as fresh or dry.

If a cow is sold the sales tax was $\frac{1}{4}$ panam for one cow. This is one kaanam of gold.

In seasons of Varsha, Sarath and Hemantha one can milk a cow twice a day. But in sisira, vasantha and greeshma only once a day is to be milked. If in these seasons one milks a cow twice he is exploiting the poor animal and his thumb is cut as a punishment. Nasyakaalam (to make an opening on nose), damanakalam, yugapinganakaalam (to put a plough on its shoulder), Varthanakaalam (to destroy the reproductive power) etc are all according to seasons only. Do not do it off-season.

From one dronam cows milk one prastham ghee is obtained. For buffalo milk it is $1/5^{\text{th}}$ more than cows milk. For goat and small goat milk, for one drona $1 \frac{1}{2}$ prastha is ghee. The pramaana of ghee is not only based on the variety of animal but also on the land, the grass, and the quality of water. The milk and ghee increase if the quality of this is more.

One who makes a quarrel between a Vrisha standing in the midst of a cows herd, and another vrisha has to be fined. Such battles between vrisha is not allowed. If the vrisha dies the fine is criminal punishment.

In a yutha (group) according to varna (colour) 10 each of different cows have to be there. The grazing ground is divided according to their preference, power comparison, and efficiency of protection. The white cattle in east, the black in south, the weak in one place and the strong in another is a type of division. For goats and small goats every 6 months there haircuts. The yutha of horse, ass, camel, swines etc also are likewise numbered and protected.

For the oxen which have their noses ringed, and have Bhadragathy as horses and are powerful to carry burdens yavasam (green grass) is ardhabhaaram (10 thulam) and ordinary grass (dry grass) double quantity of it (20 thulam). Dry pinnakku is 1 thulam, kanakundakam (broken rice and bran) 10 adakam, mukhalavanam (salt) 5 palam, nasyathailam (oil for nose) 1 kudumbam (kudavam), paanathailam (oil to drink) 1 prastham, meat 1 thulam, curd 1 adakam (to digest Rasa curd 6 adaka is the rate), yava or boiled Bengal gram 1 dronam, milk one dronam for prathipaanam, ghee 1

prastha,kshara 10 pala,sringivera (chukku) 1 pala.This is the daily maintenance coat of a ox that carry burden.

For mule,cow,ass $1/4^{\text{th}}$ of the above is reduced .

For mahisha and camel and for the ploughing oxen twice of what is said above is given.

For milking cows what is said about drinking food has to be given twice its amount .

The feeding of cattle has to be done depending upon the functions they do, the time and season, and effects ,and grass and water should be given to all alike and to their satisfaction. This is Gomandala and its protection.

For a group or yutha of horse and ass there should be 5 seed male animals (with 100 members in yutha).

For goat and small goat there should be 10 such seed males for 100 numbers

For cow and buffalo it is 4 each.

That is ,for 95 female horse and ass 5 males.

For 90 female goats 10 males.

For 96 female cow and buffalo each ,4 males of each variety to make upto 100.(These reproductive males are the seed banks and pithru of entire group /race and after their functions they become the temple ox respected as ancestor or pithru. Indus valley seals are famous with such figurines showing the importance of agrarian economy and worshipping of pithru(ancestors)of all cattle ,not only of human beings.

The food of horse ,elephant etc also are described in great detail by Koutilya.But being concerned with agriculture alone in this work I am not going into those details.

Now we have to consider the Samahartha and his division of a janapada and how a Gopa looks after the smallest unit in his custody.

(prakarana 54 55 ,Ch 35 of Arthasasthra):-

Janapada is first divided into 4 equal parts. Each of these 4 parts have villages which are classified as Uthama, madhyama and kanishta. Also divided as pariharakam (without tax), Ayudheeyam (which give honest soldiers as tax), Dhanyaprathikaram (which gives grain as tax), pasuprathikaram (that give cattle as tax), Hiranyaprathikaram (that give gold a tax), Kupyaprathikaram (that give objects of kupya as tax), Vishtiprathikaram (that give service or labor as tax). These are recorded in a nibandhapusthaka and kept.

Gopan is the accountant of a smallest unit of 5 to 10 villages employed by the Samahartha, for this purpose. Each Gopa takes a survey of the area of the 5 to 10 grama under him and give the details to the Samahartha to be entered into his nibandhapusthaka for further reference. What he surveys are given below:-

1. The pramaana of graama with its limits or boundaries.
2. The total area under cultivation in village (Krishtam)
3. Total area not under cultivation (Akrishtam).
4. Fields (kedaram)
5. Sthalam (Land which is not a field but is garden land for fruit trees)
6. Araamam (Upavanam)
7. Shandam (Plantain and such cultivations)
8. Vaadam (sugarcane and such cultivations)
9. Vanam (forest)
10. Vaasthu (where people live with their houses/constructions)
11. Chaithyam
12. Devalayam
13. Sethubandham
14. Smasaanam
15. Sathram and feeding places for public
16. Prapa (thanneer panthal for travelers)
17. Punyasthaana
18. Viveetham
19. Vettuvazhi (paths)
20. Kshethragram (Bhooparimaanam or measurement of the land)

21. Maryada or avadhi(boundary)of each depending upon the Bhooparinmaan
22. Aranyam forests of natural type
23. Vazhi or transport facility
24. Pramaanam or area big or small
25. Sampradaanam or details of previous deeds and daana or gifts to Brahmins, Temples etc
26. Vikrayam .sales deeds if any
27. Anugraham
28. Parihaaram
29. Houses which are karada(taxpaying) and not(akarada),the distance between each .
30. A census of how many people belonging to the each varna .
How many does agriculture and of what crops
How many does goraksha
How many are Vaidehaka(Merchant class)
How many are kaaru(artisans)
How many are karmakara (service class)
How many are daasa (servants)
How many dwipada(human beings)
How many chathushpada (cattle with 4 limbs)
How much hiranya,vishti,sulka and danda(army)is given per year to the king from each of these .
How many women and how many men and children are in each house
How many are old and weak
What is the job of each of the member of the house
What is their aachaara or history /origin /from where did they come originally
What is their ajeeva(gain or aayam)
What is their vyaya (expenditure)

These are provided by Gopa to a Sthanika (The one who looks after 1/4th of the janapada.).Sthaanika gives all details to the samahartha,the officer of all the four divisions of the janapada.In

the territory of the gopa and sthanika ,the samahartha has to employ pradeshta(who does tests or experiments)karyakarana(to punish corrupt pradeshta),and if needed people to forcibly extract bali (balipragraha).

Samahartha employ some secret purusha (goodapurusha)as intelligentia in each grama to check everything that is given by the gopa .They directly collect news and facts and give it secretly to the Kings men .These goodapurusha are living as grihapathy (family man) or as a vyanjana (merchant)among the people themselves without even the gopa knowing their whereabouts .Grihapathivyanjana are goodapurusha to know agricultural products, history of village and the other things related to land and its produce .The Vaidehikavyanjana are goodapurusha to collect information on markets, market values,mines,bridges(sethu)forests, boundary areas, temples etc and the extant of kings real property from trade and commerce from such sources and their value and whether someone is doing mischief with it.

Thaapasavyanjana are goodapurush of the king to check the functions of the Karshaka,Gorakshaka,Vaidehaka,Grihapathy etc and thus exert a check on adharma by all class of people. It is important to note that Koutalya says that the disciples of the Thaapasa who are the main aids of the Kings were the puraanchoravyanjana (The oldest community of thieves)and they know all chaithya(the junction of four paths of transport),soonyapadam(places where no one lives or enters as hiding places),udapaanam (places where water resources exist),origin of rivers,nipaanam(lakes),theerthasthana (old sacred waters),asrama in forest,aranya or deep natural forests,sailagahana or caves in mountains,vanagahana or deep forests and can travel in all these areas alike .Thus they are the best aides for the king and the thapasa to find out the secret ways of enemies ,of thieves ,their place of hide outs,their travels ,and cause of their arrival etc and are the best intelligentia and best allies for protection of country. Thus the Puraanchoravynjana were given a most venerable place for their

service and honesty and were the best army and police and intelligent service during Koutalya period. These are the oldest forest and mountain dwellers of the Indian subcontinent as they are called the Puraanachoravyanjana and it was from this race that all the old South Indian dynasties originated and from them by cross breeding originated the North Indian dynasty. The race is now called Piramal kallar and its gene is about 70000 years old as shown by genetic study. The rule of perumal in Kerala from this chora /Chera lineage of Tamil population (They existed all over South India and concentrated in Konguchera, and in Malayamnadu which is present kerala) and enjoyed the rank of most honest tribe which they proved during PazassiRaja period .Pazassi (old tribal king) and Payanghat Raja(as the old Arcot was called in pre-British period) have the same lineage and same ancestry. And Indian subcontinent has same ancestry. The word kallar or chora does not designate them as thieves ,but as old race which occupied a wandering and cave dwelling forest life as Adivasis of the land and loved it as dearly as their own jeeva and it was from them the Kshathriya, Brahmakshathra and the vaisya class were born .Therefore it is the most ancient Aranyaka class and most venerated (Pithru or ancestral status).

The Gopa in an urban set up has to think of 10 kula or families ,or 20 kula(families)or 40 kula (families)as the case may be. He has to record the names, the colour, the signs and birthmarks, the functions, gender ,gothra, ancestral origins, etc and keep a Jamghaagra(Janasamkhya or census) maintainance. All their functions, gains and losses should be recorded by the urban Gopa. Similarly in a town 1/4th of the town is taken for care by a sthaneeka. The authorities of dharmasaala should inform the gopa and the sthaneeya if a pashandi or a unfamiliar person come there .They have to first test them personally and if there is a doubt the information passed on to higher authorities. Similarly the kaaru and silpi and thapaswain grihastha etc test people who come to their house for learning or for trade ,commerce etc and keep them

in their place as guest only after testing. Vaidehaka also has to do this with travelers for safety of villages and towns.

In greeshma in the 3rd and 4th part of daytime no one should light up a fire .If someone wants to cook food at that time do it outside the house so that the house does not get a fire. In these times ,for 5 khatika time each house should have kumbham(water pots),droni (water baths),nisreni(ladder), parasu(axe),soorpam(woven muram), ankusam(thotty),kachagrahani(to pull hay from housetop) ,druthy (bladder with skin to fill water) should be ready at hand because these are times when one can get a fire and each house should have a at hand fire extinguishing devise like this.

In greeshma season the houses with thatch of grass should be removed. The people like ironsmith ,goldsmiths etc who use fire for job should live together in a neighbourhood.The head of each family should be available at home in night in case of any emergency. In pathways, in junctions, in doors of towns etc and in palaces(big houses) 1000 kumbha should be kept ready with water to quench a fire in emergency.

For one who burns a house killing by burning is the punishment. If one puts dirt or rubbish in pathways/roads 1/8 panam and if with dirty water 1/4 panam is fine .If the road is a royal road for public transport fine is doubled.

If one do excretion in temple premises, in premises of water (river.tank,lake,well)etc from 1 panam to depending upon the extant of pollution increasing fines should be given. If the dead body of an animal or of a human being is disposed in the town premises there is fine depending upon the animal.

Cat,dog,serpent,mongoose etc carcass disposal in town/village premises:- 3 panam fine.

Ass,camel,mule,cow etc 6 panam fine

Human carcass 50 panam fine

People have to take the dead body through the gate meant for corpse to the burial ground. They should not dispose dead body anywhere except the burial ground decided for them.(And people for disposal of such wastes therefore should be located near burial

ground in each grama /urban city at the periphery .).The pace at that boundary is called a Cherikkal (chery or sery means the side or belonging to that particular kings service).

9th chapter says that any place except Brahmaranya,Somaranya, Devalaya,Yajnaasthana,punyaasthana, can be converted into fields for growing grains.

About irrigation rules this chapter gives some guidance.:-

Suppose there is a lake in the heights (uparithataaka) from which a land is irrigated and a lower lake is newly made in the lower plane (Adharathataka).One should not use water from the new lower down lake for cultivation in the upper field that is being already irrigated by the existing lake. Similarly if a lower lake exists already and is in use ,and a new upper lake is constructed for storage and irrigation, by that newly available water source one should not obstruct the already available water source below. Any one who dries up the entire lake should be given proper punishment. Suppose for three years the lake could not be used for irrigation of a field for agriculture, in that case the first two laws mentioned need not be considered valid. If a water source is not used for 5 years by someone(except in exceptional cases of calamities and disease etc) the ownership on that sethubandha and water source is lost for the owner.

When a new lake or canal is built for irrigation ,for the first five years a pariharam(tax free)is to be allowed. When an old lake is being made use of by reconstruction, a pariharam for 4 yrs is given. If a water source is lost by growth of grass and it is being reclaimed ,then tax-free state is for 3 years. If the ownership changed due to sale or another reason, then the time required for the new person to reclaim and start production is two years as tax free.

Lands are irrigated by various methods which include artificial Vaathapravarithimam(Windmill driven irrigation) , Nandyayathanam(with oxen from canals, large ponds ,wells

etc), Nibandhayathanam (by a sethubandha or a Bund as we call now) and directly from lake (Thataakam). Depending upon such methods and the produce and effort taken by the person who does agriculture, the part of the produce has to be given and the tax to be fixed. If a lake or a sethubandha become in a repair state, the people who sell or leave the land irrigated by them etc should be made responsible for the repair cost, tax etc. Those who enjoy the benefits without paying tax or share also are liable to give a share for repair either by money, things or by service. It is a combined responsibility of all to produce food and be self-sufficient in food production.

61 -63 prakarana deal with the punishment for people who obstruct society life and food production, trade and transport etc for selfish motives. It speaks of Dharmasethu built by rich people and by co-operative effort of people for common purposes and how it is maintained by good people and by co-operative effort of entire village. Similarly protection of paths for transport through land and river is also mentioned and how it has to be protected by dharma and be combined efforts of community as a whole.

Suppose a farmer accepts a land for cultivation, and does not cultivate it as expected : Or if a owner of land does not give the field for a farmer to sow seed in the time of sowing, both gets the same punishment because leaving a fertile land without farming was considered as a crime. If the farmer could not do farming due to reasons like natural calamities, and faults of the land itself or because of some weakening disease that made him invalid there was no punishment or fine.

A person who gives tax is a Karada. A karada can give the land in his custody to another taxpayer only. (both as selling and giving as a panayam). Brahmadeya people can do so only to another Brahmadeya. A karada cannot go and stay in an akarada grama and stay there as akarada. (and probably vice versa) but can go anywhere and live as a karada. To sell the land to one and the house to another was not allowed. Suppose an owner cannot do farming in a

field and gives it to another for a time period ,say 5 years ,he can do so and after 5 years taking whatever he rightfully deserves from the gain ,he has to give back the land to the owner. For akarada ,who do not pay tax they can get the bhoga from produce but no other rights are possible .When the village chief goes for official duties ,outside the village one of the villagers should accompany him on a rotation basis as assistant .In each grama there should be boundaries marked by upassalam(small wall)and 4 pillars and grazing ground, high grounds and forests should be available for each grama as their common property as multipurpose utility. Suppose a farmer first agree to do everything for the village co-operating with others and then by some reason does not do it ,the fine from him is for the village common panchayath and not for the king and they themselves can decide the punishment for such nonc0-operative irresponsible activity and law breaking. Same is applicable for festivals etc which is for all people .If someone suggests a karma which is for sarvahitha(welfare of all) everyone should obey him and do it together .If someone or a group hurts such a person they have to be punished. Trade and commerce as Pravahana is not done by Brahmana usually and there is no need to pres them for it and they should be given a share in it even if they do not do it ,since they are saying sarvahitha.The jyesta and sreshta is that one who says sarvahitha for welfare of all and he should be respected and obeyed for welfare of all.

63rd prakarana 11th chapter is on interest and loan for accepted rates for trade,commerce,for forests and landroutes,for waterways and oceans (boats, ships)etc .

Monthly interest for 100 pana as dharma is $1\frac{1}{4}$ panam.

For trade and commerce is 5 panam

For transport through forest land routes is 10 panam

For sea route is 20 panam.

The interest of paddy in season is upto $1\frac{1}{2}$ panam.Beyond that it will increase only when the cost increase. Interest and capital should be only $\frac{1}{2}$ of the total interest of the capital amount.(That is

when cost increase ,the actual initial cost of the grain +the cost of the increased grain is the samkhay.The cost of the increased grain value should not have an interest more than the interest for the initial cost of the grain).And if taken as grain, the interest is only for the production season and in other seasons it should not be asked. So people prefer interest as grain.(Not cash).Increasing interest indiscriminately was not allowed and was punishable. The interest free loan is for a person who has been involved with a prolonged yajna,for a person who was sick for long time,for a person who had been doing Gurukulavaasa(a student) and for a child and a person who is ignorant of the laws of the land (Mandabudhi).

If a loan as debt was not repaid for 10 years ,no one should try to get it back. It has to be decided as not repayable(exempt)loan. For child,student,old man,sick,who has gone out of country etc the laws are not applied. if the person who took loan die his children and relatives who acquire his property are liable to repay the loan. Two people should not pressurize one person to repay loan. The debt for srotheeya and for king(tax)has to be allowed to pay first and then the others in order.

When there is a dispute over property, or loan, repayment of interest etc the best witness is one who is purest,unselfish,honest and respected by all community .When the other witnesses have difference of opinion also such a persons witness is taken as final word .A Brahmana,a Pot filled with water, and agni are kept in front before a witness is asked about truth.(Because Agni,water and Brahmana are considered pure).

Salary is for a function done. If someone takes salary(money) saying that I will do this and does not fulfill it he has to be fined.(The salary for being jobless is given in our State now. I was just thinking of this .And also that many of the officials get salary for things which they are not doing ,and not for what they are doing or achieving for the national benefit!!!).For vaakparushya and insult of people for their knowledge,scholarship,about their jobs (like that of kaaru and vaagjeevana)about kuseelava for their

music and dance, about eastern Huna and Gandhara people about their place of origin ,and about any one regarding their profession, colour ,beauty etc was considered a crime and an Arya (noble) person will never do that .If someone does that and it is brought to notice of authorities ,a punishment was given.(The eastern Huna country being called Chandaalarashtra ,and Gandharadesa as the land of kapati like Sakuni etc).The desa,graama,kulasangha,and devasthanana temples were not to be insulted or polluted.

Dandaparushya is touching (sparsana) avagoorna(to try to strike)and prahatha(strike) another person. The dandaparushya to flowers, plants ,trees and animals birds and human beings were punishable. To cut trees and destroy plants and forests was punishable crimes .

Kaaruka and their sreni:- (A guild of people who perform a profession like the different smiths of iron,gold,silver,stone etc and the makers of cotton threads and other artisans)only those who can give back amount if a risk happens to the articles and their sales, and who has a group of kaaru under his rule, who has a capital or a group of friends with capital, and who makes jewellery and other articles with own wealth ,and who are living on srenipramaana(as a kulasangha or a guild)are entitled to receive a nikshepa(capital) for production of things needed for a commercial enterprise. If a loss happens accidentally to that capital ,the sreni will pay back the amount .

Kaaru does job knowing place and time and purpose. If the time taken is exceeded of what is fixed before the 1/4th of salary will be decreased .And twice the salary is taken as fine. If the loss is by elephants or mahisha(this type loss is called Bresha) or by upanipaatha(kings displeasure)they are not responsible for that loss.

Thanthuvaaya(weavers)who get threads ,have to increase the weight of the dress woven like 10 palam thread to 11 palam dress. The cost of thread is the salary for the weaving. For kshoma and kouseya (silks) the cost is 1 ½ more than cost of thread and for pathrorna,kambala,dukoola twice that of thread is weaving cost.

The woven dress should not be smaller than what is asked for. If it is thulaaheenam(less weight) or if the thread is changed for less cost thread etc punishment is there. For wool loss by purification and loss of hair while weaving has to be considered.

The rajaka (washermen) has to use soft stones or wooden planes for washing. They can wear dress with symbol of a mudgara alone .Any other dress with any other symbol worn by a rajaka means he is wearing the dress given by some one else for washing

.Mukulavadhatham(white as a flowerbud)needs one day to purify.

Silaapattasudha needs 2 days (pure like a stone surface)

Dhouthasuthravarna (with colour of thread used) need three days

Pramrishteswaram(very white)needs 4 days for washing.

Kaavi needs 5 days to dye. blue dress need 6 days

Dying with pushpam,laksha and manjishta need 7 days. And very valuable and which needs extreme care n washing also needs 7 days .

For valuable clothes 1 panam,for intermediate $\frac{1}{2}$ panam and for lowest quality $\frac{1}{4}$ panam is salary.

For gross cotton one or two mashaka is the rate. For red twice its rate. for first washing the $\frac{1}{4}^{\text{th}}$ of cost is reduced and in second wash $\frac{1}{5}^{\text{th}}$ of balance is reduced .

Suvarnakaara or goldsmiths and how he makes panchaloha and the weights and measures used and the methods used are all discussed in detail .the numismatics of the time is given importance. Role of vaidya and surgeons, of kuseelava ,chaarana and Bhikshuka are all considered in detail .

Readers might have understood from the naming like Gopa and VaidehakaPravahana etc the role and duties of NandaGopa (father of Krishna) as chief of agriculture and goraksha and of Janaka ,king of Videha as a trade and commerce person .The Videha Pravahana Jaivali Brihadaranyaka Upanishad and janaka of Ramayana and Seetha or land /bhoomi as his daughter also gets a proper perspectives when we read the original texts like Arthasasthra and understand the history of India from such technical terms used in historical accounts .

How to protect people and land from unexpected calamities?

There are 8 great fears which happen due to God's displeasure.

Agni(fire),Jalam(floods and droughts), Vyadhy(epidemics)
,Durbhiksham(famine),Rats,Vyaala(big animals),Sarpa, Rakshas
(unknown factors) are the 8.The king has to protect people from
them .

Protection from Agni:- he precautions to protect house from fire
was said earlier. To protect the forests ,grasslands etc from fire
people should kindle fire only in places which are indicated by the
Gopa)Dasakulirakshaka).In Parva(newmoon,fullmoon)
bhoothabali, homa for pleasing agni is also done and swasthivach
aka uttered.

From floods:- during rainy season people in the Anoopadesa (low
lying places near sea level) should stay away from the tidal areas.
The things necessary for protection from floods like wood,
bamboo, boats,ships,alaaaboo(churakka for floatation),Druthi(skin
bladders from animals),plavam (floating woods),ghandika (piece
of wood specially made for floatation)etc should be ready .All
people should help in rescue operations of people who are
accidentally involved in flood waters.In parva ,pooja of waters
(river, ocean) and homa are done.(Varunapooja). Indra,Ganga,
Mountains, winds,and Mahaakatcha(great Katcha or Varuna who
protects the Brigukatcha or Anoopadesa of west coast)were
initiated. The same existed in east coast as well.

Vyadhibhaya:-by proper medicines and by help of vaidya
,oushada,vanaspathy ,sidha and thapasa ,santhikarma etc has to be
removed. With this the great disease of Mahaamari or small pox is
also said. For that special theerthasnaana,Mahaakatchavardhanam
,milking a cow in a burial ground, making a image of a dead body
with ground grains and burn it in a burial ground for satisfying
ancestors, and Devarathri(spent a sleepless night in front of a idol
of God) are done. If mahamari is happening to a cow it has to be
quarantined in another place away from the herd. In the middle

yama of night and day one has to do ardhaneerajana (to show an arathy with fire in front of it) and do pooja of devatha.

Famines:- The king should give seeds and food grains for people during famine. The share which they have given to him in good times is properly kept and spent judiciously and saved for a bad time so that he can help all people with their day to day food and functions even in drought and famine. At famine times King can resort to some great construction work like a palace or temple or a lake etc so that he can give food as salary and will not be making his people lazy by giving food free. He can give free food as a charity on special days and make the rich people of the area do the same. The friend kings will also help the king at such times. Or if there is a place where there is lot of grain and there is no body in that area (this existed only in old days ,not now)the king can take his people there and stay there and make a new grama or town there. To live near ocean, lakes and rivers and to cultivate in sethu grains,fruits,vegetables ,roots and tubers etc ,and in such times to order killing of birds and animals for reducing hunger of subjects is not considered a sin .(It is just for survival and after the famine one has to resort to old habits and rules).He can sent people who are excess in his place (like dancers, musicians etc to other king's courts to decrease population)and allow people even to eat fish, birds and turtles etc in a famine period. These are all exceptional behaviors allowed.

Fear of rats:-Grow cats and mangoose.The dogs should be tied by all except the forest dwellers. To kill rats grains smeared with milk of cactus ,or poisonous grins can be used. Similarly fear from other pests has to be dealt with.(flies, butterflies which hatch eggs on paddy and kill it before it is mature by the worms that issue from eggs ,from other worms etc).

Fear from forest animals :-When man-eaters or any animal that kill domestic animals approach ,the killed animal body is smeared with madanarasa(juice of Madanakameswari fruit) and with kodrava (marankara ari and varakari) and keep it as a trap.Lubdaka and swapacha keep their artificial traps, and pits and try to catch them

and kill. The groups of animals, groups of birds and crocodiles etc also will have to be dealt with in same manner if they enter the field or a village .

Fear of serpents:-By mantra oushada the physician has to treat the snakebite .Citizens as a group can deal with killing of population of serpents if their fear is more.Sarpapooja is done for their shanthi and blessings .

Rakshas fear:-By atharvayoga and by magic this has to be dealt with .In parva,in Krishnapaksha ashtami,in chathurdasi etc on the vithardhi(floor) a chathram (umbrella made of palm leaf)is placed.Ullepika(a type of appam)a hasthpathaaka (a small flag)and a chagopaharam (bali of a goat)are done as chaithyapooja (mantra Charum Vascharaama:)) is done by the manthrika and Atharvans The people give havis for such durdevatha when they are in fear .

(Koutalya does not mention the pooja of Kalichan daiva done under an elanji tree in a field by the adivasins and by the cheruma who are the people of the cheru or lowlying naadu of Kerala .It is with paalpaayasa or milk pudding that they do pooja for kaalichaan or the God of Cows as their God Krishna and this is the pouring of milk and honey and ghee in field described in veda as a pooja).

The punishment for one who splits and destroys a sethu which hold water is to kill him by drowning in that water itself and that is done as an example so that no one should break a sethu or a bund .If a person breaks a sethu which does not hold water ,his punishment is a great fine only.

In a severe famine period if a king tries to get more tax from a portion of his land which is not suffering from famine or drought (to feed people on the other part)it is not against rule.Devamathrka land(which gives more produce just by rains) is able to give 1/3rd or 1/4th of its produce to kings in such times. From other types of lands tax can be taken only according to its nature of production at that particular time.

From a janapada which has only little wealth, or is situated at the boundary, and yields a lot of Hastivana, dravyavana, mines, vanikpatha which are important, and has sethukarma and durgakarma (protection as a durga and gives enough water by irrigation) no king should ask for more tax since they are most useful to him as help to increase treasures and to help in needs of famine etc and for day to day trade, commerce etc.

If a person is ready to live in an uncultivated land and make grains, vegetables etc there he should be encouraged by giving grains, seeds, animals, and wealth by the king and his men. The $\frac{1}{4}$ th of his produce or the balance after seed and food purposes should be purchased by King itself to encourage him to produce more. The grains that are grown in forests (wild grains like chama and varinellu and the Brahmadeya are taxfree. But king can give its value and buy it so that the people are helped in that way.

In all uncultivated lands the people of samahartha has to make farmers sow in Greeshma. The record of giving seeds is kept with a warning that if loss happen due to their carelessness a fine will be taken. When it is ready for harvest, the immature or mature grains are not for the farmers but for common treasury. The handful of grains at saakamushti and kadabhangamushty are exempt from this. The grains for devapooja, pithrupooja, for food of cattle, bhikshus (guests) and for service class (graamabrithaka) like blacksmith, goldsmith etc) the raasimoola (the grain that is fallen from bundle during harvest and its taking home) is to be given.

The $\frac{1}{4}$ th of grains, $\frac{1}{6}$ th of forest goods, cotton, laksha, wool, valkam, silkcotton, hairs of animals, kouseyam (silk), oushadi, gandham (fragrant things), pushpam (flowers), fruits, saakam etc should be given for king by each citizen willingly and with a co-operative basis for welfare of entire grama. (since it comes back to them in times of famine etc). The $\frac{1}{2}$ of elephant horn and skin is for king. wood, bamboo, dry meat etc have $\frac{1}{6}$ th share for king.

Gold, silver, diamond, emerald, pearls, corals, horse and elephants and their trade people have to give $\frac{1}{50}$ th of their wealth and the gain ($\frac{1}{50}$ th) to king. Thread, clothes, brass, copper, gandham, mixed metals

,medicines, beverages need $1/40^{\text{th}}$ as tax. For grain, ghee and other Rasa, iron etc traders and for cart traders (people who do trade in vehicles) $1/30^{\text{th}}$ is tax. For traders of kaacha(lenses) and for Mahaakaaaru(great kaaru like gold and jewellery dealers) $1/20^{\text{th}}$ is tax. For kshudrakaaaru (wood worker making only household articles of day to day use ,and utility things for the village only)and for Vardhaki(silpi or maker of idols)and for poshaka(helpers) $1/10^{\text{th}}$ is tax. For traders of wood,bamboo,stones,sand as bundles, and cooked food ,and vegetable curry etc $1/5^{\text{th}}$ is tax. For kuseelava (singer/dancer/bards) and prostitutes $1/2$ of salary is tax .

Even if the traders do not do their job they have to pay tax. The rate then is for person $1/10$ kazhanju gold. For growers of small animals like goats etc $1/6^{\text{th}}$ is tax. For cows, buffaloes ,ass,camels $1/10^{\text{th}}$ is tax. For people who protect beautiful women and make money through them(vesyaposhaka) king can increase his treasury (since $1/2$ of her gain is for king).The moola text say

Bandhakiposhaka (one who looks after the bound women who are beautiful).

Increasing tax is admissible only once by a king .Not twice .For giving money and wealth in this way the king has to give certain symbols like a position or title, power f using a chathra (umbrella) ,and a veshtana(a special head wear)and jewels etc.Similarly for a woman who gives more income to treasury the king has to give a sibika(a vehicle for her to travel)and special positions and rights in temple s and palace.

Among many methods koutalya describes keeping a idol of a naaga with many heads in a well, in a cave or a special place and saying that it is a divine place and when people come there to collect tax as jewels, gold etc from them(This was what was done by the kings in and around the time of Arthasasthra and the Jain/Buddhist period caves were made in such a way to get money out of the superstition of people).

We saw Vaidehaka Pravahana jeevali in Brihadaranyaka upanishath.What is a pravahana?Koutilya says a famous vaidehika merchant person can say that for Pravahana(to make it shine with

chemical juices) can collect silver and gold jewels from several people and can show them to people and sell it and get lot of money as loan from them saying that when he finish selling them he will return the loan . This is a sort of commercial trick played twice on different people If done with dharma it brings good results for all (probably during time of janaka)but when done with bad intention of cheating as in time of Koutilya it is adharma. But we know that pravahana means one who can do alchemy and is proficient in trade of quality jewels and stones etc. According to Koutilya a king can take anything from his country like a person plucks the mature fruits from a garden. But he should never resort to take everything so that the people are in trouble and revolt and block his rights by their rage .By taking $\frac{1}{4}^{\text{th}}$ of whole of the produce from the citizens a good king can rule the country with peace and with welfare of all if he is careful .There should not be injury to dharma or artha in a good kings period.

The expense for Rithwik, Guru, ministers, purohithan, commander, yuvaraja, Rajamatha, and pattamahishi is 48000 Rs each .With that they can lead a very good and luxurious life and will be satisfied. The keepers of inner quarters, prasasthaa (saasthaavu) or the adhyaksha of the weapons, protectors of nation and samahartha should be allotted 20000 panam each .They will then do functions efficiently

For prince and his mother ,for a Naayaka (of 80000 soldiers) ,for the vyavaharika of citizens, members of manthriparishath etc 12000 panam .

Chiefs of sreni ,chiefs of elephant protectors, and horse protectors, and chariot protectors, for advisors 8000 pana is given for administration. Then they will bring their honest people and relatives for the jobs in palace.

The adhyaksha of various departments are given 400 panam. For physicians ,Vardhaki, and chief Daksha or architect and for yoniposhaka (who increase animals ,birds, and men races), 2000 panam.

For karthanthikan(who knows anthropological lakshana of men and women)naimithikan(who knows nimitha),mouhurthikan (knower of muhurtha),pouranika,sootha,maaghada,and parikarmi of purohitha 1000 panam.

For knowers of architecture and silpa,for army on foot, for samkhyayana or accountants, and lekhaka(writers) 500 panam. Kuseelava get 250 panam.Of them instrumentalists get twice that of bards.Kaaaru and silpi get 120 panam .

Protectors of chathushpada and dwipada (animals and men)and their paricharaka (assistants),parikarmika ,oupasthayikan(who does service of the body)vishtibandhaka(supervisors)get 60 panam.

Aryayukthan (accompanying a king as his friend .He should be a noble person with soft character)arohakan(who brings horse or elephant for king),maanavakan (a disciple/a vridhachora or old thief)sailakhanaka(mining stone in quarry),and sevaka ,acharya of dance and music ,vidwans of sashtra ,etc get according to their quality from 500 to 1000 panam.This is called poojavethanam or a gift of reverence from king or an award for state service.

For an intermediate messenger for each yojana 10 panam.From 10 to 100 yojana for each yojana one has to give twice that for the previous 10 yojana.For rajasooyam etc the one who is the representative of king (this means the invited kings,silpi,etc have thrice gifts than the rithwiks)

Gets three times more gifts than his equal scholars and for the charioteer 1000 panam is salary. For goodapurusha like monks, grihapathyvyanjana,vaidehikavyanjanana etc 1000 panam .For gramabrithaka (rajaka,kshuraka etc) and for sathri,theekshanan ,rasadan,bhikshuki etc 500 panam.For assistants of the spy 250 panam or depending upon efficiency and work an increased amount is given.

Each of the class of officials are grouped as 100 each (just as the cattle were divided .This is for easy administration)or as 1000s and for these groups an adhyksha or group leader given .These chieftains should get the share of salary from King and divide it among his group accordingly as decided and without partiality.

And they should carry out orders of the eking through his people for welfare of all. The protection, growth and expansion of the wealth of the king depends upon the efficiency of each of these kulasangha and their honesty. Such chiefs will be many and several mukhyas will be under a hierarchy of chiefs and all under the king and several kings under the emperor. In this way all janapadas function as decentralized units under a unified centralized hierarchical empire which has dharma of protection of all life and people and nature and natural products. The unified empire thus functioned from below upwards from a simplest unit, the kula or family and graama and to the highest Ckakravarthy as having the same pattern of function but a higher scale. It is better to do a sandhi of peace than do a war for welfare of all. But if the other party is not an intelligent person to understand the benefits of a peace treaty this will not happen and the reason for such situations are ignorance of either one or two parties or the ego of one or two parties. And rules of sandhi is elaborated in several chapters which are important for today's world but this being a book on agriculture I am skipping those parts. Koutilya says the old acharya had thought about the question:- Whether the great gain obtained by long term or a high and quick gain in short term is great? They have said that a quick gain if it is according to time and place is greater. But according to Koutilya this is not entirely true. Even if it takes time a long-term gain which is achieved by prolonged period of experience and without obstruction has continued for several millennia or centuries is like a seed that gives gain forever by ever multiplication of its race. It is greatest gain for any nation. But the quick gain has to be resorted to only during emergency periods. And in certain periods the quick gain is resorted to as best according to previous acharya but in all times it is better to think of long term gains of nation and of humanity. And this view is the best economic and ecological view. Look at pros and cons, of loss and gains and compare them as if on a balance and then if gains are more with a sandhi with a person or a nation have a peaceful coexistence with sandhi. But if this is

not going to happen even after allowing every thing for a peaceful co-existence then a sandhi becomes futile and sometimes even detrimental. For example if a sandhi is done with a warring nation having less food and less wealth ,just for helping tem and expecting that they would be happy for the help ,and if we spend all food for the welfare of that nation and still that nation is seeing the helper nation as an enemy for centuries or millennia from that experience one has to learn a lesson .A sandhi is done for co-operative increase of food and wealth and welfare of both countries and not just for prevention of war .And a nation which does not see reason (like co-operation for common welfare of entire world)will never be satisfied with whatever help you do .This type of weighing pros and cons was done even in ancient times .Bhoomisandhi is for acquisition of more land and empire expansion.Anavasithasandhi is for increasing production in a land that is uncultivable by teaching good agricultural methods etc by sharing water, seeds and expertise etc and sharing of forest and field produce for other articles and natural products. The best land is the land suited for agriculture since food is basic of all life .The people who do krishi and goraksha are good land with lot of rains,grains,grass and forest produce .(Kerala and the anoopadesa from kerala to Gujarat in Brighukatcha including Krishna's Dwaraka is such a land and Krishna is called AnooopadesaBhoopathy in Bhagavatha .)In such a land food ,forest produce and trade and commerce of these result in unprecedented wealth and kings are able to help entire subcontinent if they efficiently rule the land. The wealthy traders and sea route and land route travelers also are more in such places. Another good quality for a land is its protection by natural water body(oceans,rivers,lakes etc)and mountain tracts .This also was true of brighukatcha and kerala is part of it from Parsurama times. A king of such a land should never make a sandhi with a dishonest or strange person to get short term benefit since it will jeopardize the entire nations economy .,says Koutilya.Karmasandhi is a treaty in which a sethu or a waterway or transport, a canal etc are built by

combined effort .The kings of kerala were doing this for agriculture. Logan describes the rival kings of Zamorin and Cochin doing a treaty like this to make a bund in Thrissur Kol puncha so that both territories and their people benefit by it.(So what was said in BC 320 was being done even in 16th century India).About the two types of sethubandha Arthasasthra says :-Sahodaka (with natural water)is better than an aharyodaka (the water to be brought by canals or artificial irrigation).And among two sahodaka sethubandha or bunds ,the one which gives more lands to be suitable for sowing seeds has more greatness.

Similarly among dravyavana (natural forests with forest produce) a land having such forests in the boundaries with valuable trees and produce and with nadeemathruka(several rivers)in it that land is better than other lands both by the wealth it gives and the hiding place it provides in times of need .Hasthivana(with elephants)is better than forests without elephants.

Then Koutilya thinks about mines. Whether a mine with things having less value but is very big is greater or a mine that is small but yields precious valuable things is great?

According to Acharyas before him the small mines which yield precious things is great since it brings more wealth by a single sale. But Koutilya has a more practical approach. He says the prospective buyers for precious jewels are less in number and a sale happen once in a while only. But the day to day things are purchased every day by all, whether rich or poor and hence a place having such things in plenty is having a constant sustained market in all times and it is better to have that for a sustained economy and self-sufficiency.

The next question in Karmasandhi about transport of the articles for trade and commerce. Is land route better than sea and water routes? Among land routes and water routes themselves which is best?

The view of previous acharyas he quotes:- Water route is maintained by low cost and have more gain if used for trade. The land routes need maintenance and protection from thieves etc and is having more cost and is risky is their opinion.

Koutilya's opinion:- The waterways are not always navigable in all seasons and there too are several difficulties and losses (like shipwreck etc) and natural calamities. The land routes give a constant way of sharing things with neighbors and for neighboring villages and for neighboring nations if they have a friendly treaty this transport is good for self-sufficiency in food and other articles and for grazing cattle etc. The waterways if present give an added advantage in suitable seasons for nations. Both if available the communication network is extensive and sharing and unification is easier. The water routes have two types. Koolapatha (along the coast of river, sea touching all places and slow travel) and Samyaanapatha (through middle of river or sea touching only important ports /markets. Both has its own advantages and disadvantages. The koolamarga helps neighboring villages to exchange things and make a wide network of transport among all people. The samyaaanapatha helps to reach quickly a place of destination like a place of demand of a valuable article and is to be used for such purposes and the protection and maintenance cost exists for such routes also. So the choosing of transport depends upon availability of the transport system and availability of the raw material in the place and presence of a network of unified trade and commerce centers all over the country for such trade and commerce.

Among the land routes there are two. One is Utharaapatham (Northern route) called Haimavatham and the other is Dakshinapatham (the southern routes). According to old acharyas Utharapatha is better because of availability of elephants, horses, fragrant things, ivory and horns, ajinam (from bark of trees), silver and gold there. But Koutilya opposes this view. He says except horses, Ajinam and Kambalam (mats/carpets made of wool) all the other things are more in the southern part of the country. And in

addition the south has conches,diamonds,jewels like Rathna,pearls and gold in abundance .And Dakshinapatham has both land and water routes more than the north for creating a network of transport all over .Therefore the Vanikpatha(trade routes)of the south had been crucial in the economy of India .

In short ,the more the raw materials and the finished goods, and more the markets for them and more the number of people who demands those things, and the more the number of trade routes available ,that place is a better place for anyone to make a karmasandhi .Thus Koutilya's logic says Dakshinapatha is and had been the strength of India for food sufficiency, for trade and transport and for unification of the entire subcontinent based on a strong economy and administration depending upon the peaceful treaty between kings of various regions.

Among the land routes he describes chakrapatha(the roads on which the wheel or carts/chariots travel)paadapatham(on which people move on foot),and in some regions and in some seasons the routes with animals like ass,mule,and camels ,ox etc .He also speaks of an asampada (a narrow lane)which is used by people in villages for carrying loads etc.

If the karmodaya and economy is equalized in all regions by such unified administration depending on availability of resources and sharing ,that sthaana or place becomes famous and praised by all for its economic stability and equality. If gain is less and expenditure is more ,it is not good for a nation. If the gain is more and expenditure is less the nation is prosperous. If both are same or equal it is called sthithi .With less effort ,a place getting more gain and having a balanced economy of all other places ,that person (king)and the place become successful in administration.

The sandhi of dharmic and honest kings were done with honesty of their word itself(102 and 103 prakarana).In later yugaas when dharma was less ,people started to do a satya or a prathigna touching earth,fire,water,the sand ,the ivory,horseback,the chariot, the weapons, the jewels,seeds,fragrant materials, rasa,gold ,hiranyam(the gold coin)etc saying that the one who break the truth

by dishonesty will loose these articles(Sree).And with witness of a great unselfish thapaswin or a great minister or a noble person as a prathibhavyabandham(as a jaamyam)etc.Prathigraha is to keep a relative or ones wealth as a sign for such jaamyam .(still we do this when we take a loan from a bank or a private person).The sandhi by giving a king's daughter in marriage to another king's son creates a peace between the two regions permanently since successors belong to both regions as grandchildren of both kings. Vyasana (Calamities) :- This is given in 8th Adhikarana in 127th prakarana.

Suppose a calamity happens to both ones nation and a neighboring place what should one do? Should one resort to set right the problem in own region? Or rush to the neighbor's help? This is called Vyasanachintha or thinking of functions during a calamity.

The calamities are grouped as Daivam (by divine or natural causes) and Maanusham(manmade) and these happen due to anayam(past deeds of a previous janma)or apanaya(due to misdeeds in present) .Among vyasana are gunaprathilomya like anger etc which are opposite to all other good qualities and make them look void and null,lack of qualities(gunaabhaava),the disqualifications which has become prakata(revealed to all),prasangham(attachment to women, hunting and gamble etc),peeda(danger from various sources).The previous acharya think that the calamities are more dangerous in the order :-

Swamivyasana(happening to the king)

Amatyavyasana(to the ministers)

Janaapadavyasana(to janapada as a whole)

Durgavyasana(to a protective fort)

Kosavyasana(to the treasury)

Dandavyasana(to the criminal law)

Mithravyasana(to friends)

Bharadwaja has a different opinion. The calamities of Amatya is greater than that of king .Even if the king has calamities it will not

affect the logical analysis of functioning of the Government, and its effects, loss and gain, collection and protection of army, and protection of people, and protection of next heir to throne etc and the training of the next heir, since all these are done by good ministers and not by king himself. If they are good the Government and the people will not suffer. But Koutilya says King is as important as ministers. Because he is the one who appoints his ministers himself and also supervises the function of all the adhykshas of various departments and give relief to people in natural and manmade calamities and is always their leader and if he is bad the leadership qualities are lost and entire people suffer. Therefore king and ministers are equally important in administration.

Among ministers and janapada, janapada is more important for Visalaksha another Acharya. Because treasury, army personnel, finished goods, workers, vehicles, oil and food production, come from people or janapada. If the people are not there these also suffer. Koutilya says the functional efficiency of a people depend upon the yogakshema, protection from enemies, giving facilities like sethu etc, and relief during famine, drought, giving jobs and salary and unified trade facility for the produce to make a living etc depend upon a minister who is efficient. So both have equal importance. An efficient minister makes an efficient people.

Parasara disciples think Durgavyasana is important than janapadavyasana. Because in a durga originate the treasury and the law of civil and criminal law. The fort or durga is the hiding place and protection of people in a calamity. The citizens living in a fort is stronger than people of janapada (outside it in villages) and give support to king in times of war. The villagers cannot do that and consider friend and foe alike.

Koutilya says it is not so. It is the people and the janapada which gives origin to a treasury, law, sethu, vaartha (krishi, goraksha and trade and commerce) and to a durga and even for origin of a system of administration, a protector for it. The honest, truthful,

strong and learned people from janapada has to be selected as accompaniments and protectors of durga and the best leader has to be selected from them as a king .So everything depend upon quality of a janapada .In a mountain and a island since the population is sparce no one dwells all the time and only when there is a war or a calamity they go there for a short period. Even if the durga or fort is destroyed people and the warriors among them fight for it and recreate a similar one but if a people and their prosperity and honesty is lost ,it is a real loss.

According to Pisunan ,the vyasana of treasury is more dangerous than that of a fort. Because treasury is needed for all functions of state. When there is a difficult situation one can take the treasury to a safe place but the fort will be destroyed .Koutilya says, it is not so. The treasury is within fort. The secret warfare, destruction of dishonest spies among own people, receipt of the friend's army, battle with enemy army etc are dependent on a durga,and if there is no natural or artificial durga the entire treasure and entire people will be taken away by enemies and infiltrated by their people and spies.

Kounapadanthan has said that dandavyasana is greater than kosavyasana.(Kounapadanthan is the last of the Kounapada teachers and is Bheeshma of Mahabharata ,the disciple of Brihaspathy).To suppress the armies of friend and foe, to give help for those who come for battles, and give laws for all etc depend upon Danda or army strength and its laws. If it is not there treasury is weakened and in weakened treasury state Government cannot give help to anyone .Koutilya does not agree. He says the treasury and its wealth is the reason for getting good army strength and only if good remuneration is given good soldiers remain in the army. therefore kosa is the reason and origin for all kaama and dharma. The army or danda is protecting that which is already available and it cannot create a kosa or treasury. So ,defense or protection alone is the dharma of army and for that a good production, a good economy and a good administration with good financial support from treasury and people is needed.

According to Vaathavyaadhi (Udhava ,the lawgiver and disciple of Krishna) Mithravasyana is greatest. Even if no salary or remuneration is given, even if in a far off place the friends do functions for protecting the nation and give wealth, army personnel and land for the sake of the state and in times of calamities they do help .But Koutilya disagree. The friend remains a friend and even a enemy become friend for only one having power (danda or army being sign of power).People side with the one in power .They decide that I will be a friend to the powerful, for sake of their own private benefits not for benefit of nation. When a real need for battle come as an emergency or when there is an internal strife or problem they keep silent. They join the side where power is because with power they can get wealth by investing small amounts .Their help is only of that type and not due to real honesty or altruism or love for the nation .In this way one has to determine the greatness and smallness of each of the calamities.

Prakrithy is the king and the nation. King as human prakrithy and nation as the 6 prakrithis other than the king. The vasyana of king is internal or external angers. The internal strife is greater than external and among internal strifes the anger of a minister who can turn a traitor is greater since he knows all secrets of administration of the land. Therefore a just and intelligent king should keep the treasury and army under own custody and not under a ministers custody.

Dwairajya (rule of two kings)and Vairajya(rule of people without a king or a democracy)exists. In Dwairajya there are two groups and by the opposition and quarrels between the two groups both get destroyed(as in Mahabharata).The vairajya is administered with the opinion and wellbeing as desired by the people and therefore is traditionally enjoyed by all .This is view of old acharyas .But Koutilya says it is not true. The dwairajya happen when a father and son, or two brothers or two cousins have a difference of opinion on succession rights. That can be solved by the advice and logical intervention of ministers if they are scholarly and honest and desire the welfare of the land .(This was done in ancient India

).In a total democracy the rights of one person(who is weak)is exploited by a strong person as his individual right of survival of fittest(Matsyanyaaya),and after that ,either with the feeling that this is not mine ,or because of ignorance of conditions of the land will destroy it totally. Or will take away all its wealth and leave it as a poor place. They will not try to improve it and will try to exploit it to maximum without any interest in the welfare of others(purely individualistic approach can be taken by each citizen unless there is a strong lineage to dharma).So in ancient India an approach was taken as a middle path. There is a king and a council of best ministers and there are regional leaders in each village who are from the villages itself as best human resource development people for each region knowing its culture,resources,people ,needs and each of these well connected to the central administration. In fact in principle India still follows this old custom, except that the king is not there .And because of lack of certain values (dharma)people have turned too exploitative generally which has to be set right for better management and administration and welfare of all by proper understanding of Indian history and its strengths and weaknesses.(a different approach to Indian history by its agriculture, trade and commerce and its administrative unity based on dharma is attempted here for that purpose).

A weak but aristocratic and noble king is loved by people because of dharma and his compassion and such a person is better than a strong and uncultured and brutal cruel king who loses his leadership qualities .Koutilya says where there is love and compassion for all ,all the qualities dwell and therefore such a king or leader is preferred by people .

He says ,the destruction of all that is sown and nurtured is more painful than not sowing a land at all. All the effort of the farmer is lost when such a calamity happen. Similarly lack of rain is more painful than excess rain causing floods (which brings a good crop next season) .If no rain no way to live n earth.

Therefore determine the strength and weakness of the two prakrithy and then understand that yaana(travel or migration to

another land) and sthaana (fixed position and power) happen due to these (proper administration, and availability due to natural forces) only.

Natural calamities (Daivapeeda):-

Fire, water, diseases, durbhiksham and marakam are included.

Agni destroys only a small region while floods submerge vast areas and groups of villages at a stretch all over the world and hence it is more serious according to Koutilya. A disease affects a single person or if an epidemic it affects a group of people and remains regionalized. But durbhikasham or famine due to lack of food and lack of rain is not like that. It makes entire earth a place not fit for life (human as well as other life) and is more serious problem. Marakam is death without any cause. Causeless deaths in akaala (not time for it, like a young age etc) happen with durbhiksha and with floods. Both lack of rain and floods cause such things and therefore according to Koutilya the greatest peeda for people and life on earth is caused by lack of rain and by excess floods.

The raajavihara and desavihara (hobbies and luxuries of the king and the people):- Old acharyas thought the desavihara will cause lack of functional efficiency of artisans, agriculturalists and other functionaries of state and produce great loss. While that of king does not affect the people much.

But Koutilya says it is not so. The hobbies of people (desavihara) is only minimal during festivities and during harvest and sowing seasons etc and is meant for encouragement for the people to be happy at workplace and produce more by more involvement in work. These do not involve great expenditure or luxuries and does not cause much loss of wealth and increase production and productivity. But the luxuries of king and his retinue can exceed its limits and is permanent and will reduce the economy of the state to poverty level (as it was with Shajahans rule in Mughal empire) and officials by taking corruption as lifestyle may make the people suffer and their productive capacity decreased.

What is a desa according to Koutilya? He says Desa means this Prithwi (earth). In it, the place between Himalaya in the north and ocean in the south is called a Chakravarthykshethra (empire) and it has horizontally 1000 yojana area. It has different regions in each subdivisions or desa, (forests, mountains, village, hilly areas, watery areas, lands and fields etc) and kings take leadership of administration and protection of people and dharma in all these divisions with help of people. The power, the time and the desa are complimentary to each other. If all are balanced there is welfare of all.

He says that the Kshathriyasangha (the kulasangha of kshathriya) in Kambojadesa, in Sourashtradesa are living by Vaartha (krishi, Goraksha and vaanijya) and by use of arms (weapons). Lichavi, Vrajika, Mallaka, Madraka, Kukura, Kuru and Panchala as Sangha (or kulasangha) of Vrishni and Andhaka are living as Kings. (Thus the vaisya and kshathriya are interrelated groups of sangha or guilds). Sathri (those who do sathra or yajna) are in contact with and are in the advisory and Acharya state of all these groups.

About the guerilla war techniques of ancient kings (as Pazhassi Raja or Shivaji did) Koutilya says:- When a king has only limited power and limited army, if he goes for direct war with a strong king with weapons and huge army, he will be facing failure easily like a person with no ship goes for sea trade. Therefore the king in such a situation resorts to a treaty with another strong king, or resorts to a hidden durga where the enemy cannot enter or find him and his followers and from there attack periodically.

There are three types of kings who want success in war.

1. Dharmavijayi:- Does battle for protection of one's dharma (as Krishna advocated in the Geetha). He is happy even if death occurs during protection of dharma (like the Chavhar army of the erstwhile king of Walluvanad against Zamorin during Mamankam).

2. Lobhavijayi:- This type of king is doing a battle for getting the land and wealth. Only if he gets it he is satisfied. He will resort to dishonest acts (adharma) just for its acquisition by any means.

3.Asuravijayi:- Such people are not satisfied even with getting the land and wealth of the other. they want to kill all enemy and their races and destroy entire life in the conquered territory(as Spanish conquistadors did in the Americas).

(People should know who is a dharmavijayi and choose such a person as their leader and shun the others who are selfish .)

In the last chapter (15th adhikarana Thanthrayukthy .prakarana 180)Koutilya defines what he means by Arthasasthra or economy as a science.

He says :-Artha or wealth means the effort or vrithy of people. Therefore it is the bhoomi or earth with human beings (populated regions)and their functions. The science of Arthasasthra is therefore the method or upaaya to acquire such populated earth with its wealth of men and other articles and their karma and for the protection of these(people, their functions and the wealth).It has 32 logics.

The synopsis of what all was said about each type of wealth by previous Acharyas on the subject is said in each adhikarana.

What is the goal of giving this instruction or vidya,how it should be acquired from the old and experienced (the vridha citizens),how one should practice control of senses for practice of it, and how are the ministers or advisers formed include the vidhanam.

The yogam for union of sentence and all people and life.

Padartha or objects and meaning of each name and word

Hethwartha or cause of the artha .The dharma and kaama are due to artha .

Samasavakya for cause of indriyajaya as vidya and vinaya.

Nirdessa is Vyasavaakya (the vistruthavakya or explanation).

What is meant by indriya etc.

Upadesa is advise on how to live for dharma ,artha and kaama without causing each to be destroyed in a balanced way. The practical advice Apadesam is reference of difference of opinions by old acharyas and then giving own opinion.

Athidesa is ability to say that which is to be said (predicted)by what was said (past and present).

Pradesa is that which is achieved by the solutions (or what is to be said).Upamaana is the ability to understand that which is not seen (adrishta)by the seen (drishta)or experienced

Arthapathy is the meaning obtained even without saying that directly.

Samsaya is doubt in both views of opposite nature.

Prasangha is equal meaning with another prakarana.

Viparyaya is achievement by the opposites.

Vakyasesha is the remainder of a sentence which will give full meaning to it .

Anumatham is the word of another person which is accepted and not opposed.

Vyakhyana is a wonderful exposition of a text.

Niravchana or definition is the origin of the sabda (name or functional name)from guna or quality.

Nidarsana is a example shown with another example

Apavarga is removing the utsargavidhi (abhiplutha).

The views which are not raised by other Acharyas before is swasamgna.

Poorvapaksha means an opinion of the past which is contradicted by logic.

Utharapaksha is the new logical view thus proved

Ekantham is that which is controlling all.

Anagathavekshanam is prediction of what is going to happen .(predict)

Athikranthavekshanam is the quotation of the past opinions as references.

Niyogam is a injunction that this should be done and the opposite should not be done

Vikalpam is a doubt something.

Samuchaya is adding together of this and that

Uhyam is a guess from what is not said

With all these thanthrayukthy(logical methods)the science of economy has to be approached according to Koutilya's arthasasthra .

The dharma of Koutilya is well described here as the old system itself of ancient India .The inclusion of Sukraneethi as dandaneethi in Koutilya is what makes it look like an asuraneethi .But in actual practice it was not asuraneethi at all. Then why did he include it in his economy? For that one has to go back to the political situation of India of his times. It was the first time in the long history of India that Alexander had crossed the land route and reached India and for the first time the people and kings of India understood that a person like Ambi can be an internal spy and a danger (probably after the Gandhara prince Sakuni's time in Mahabharata) and he had to instruct Chandraguptha ,the new inexperienced prince about how to deal with such people with a Bheda and Danda law while he has to use saama and daana only for the people of the land .By resorting to this he can build a strong empire and it was the same time when the sathavaahana (Brahmakshathravaisya) power also evolved in co-operation with the emperor's policies .So it was a combined treaty of North and South(Dakshinapatha and Utharapatha) ,sea and land routes, and adoption of all the saama,daana and bheda danda vidhi for administration Chandraguptha became a centralized and decentralized Republican king for the 16 janapadas of India .Thus Arthasasthra gives us the agrarian, rural and urban economy and administration of India in detail and this when compared to that of prevedic,vedic,Indus valley ,Mehrgarh period, and Harappan civilization, and Sangham literature and that of Mughal and British records of North and South India gives a very prolonged administrative history that had been continuous. Now what we have to do is trace the continuity to modern India and its problems and how we are dealing with it and how we should find solutions for it. That we will come to in subsequent chapters

Thiruvalluvar and agricultural economy

Valluvar and Valluvanaad have a relation. The valluvar and valluvakonathiri as chieftain of it was the mainstream of agro economy of Cheranad of sangham period and a valluvar from that Naad singing the glory of three purushartha(dharma, artha and kaama) is definitely aware of the agro economy of Valluvanad.

Let us see what Valluvar had written about agroeconomy. It is believed that valluvar wrote his treatise Thirukkural in BC 30. The Valluvan among 12 children of Vararuchi was also from Valluvanad. The water rights of Valluvakonathiri is mentioned by William

Logan in his Manual of Malabar. And the giving of land for cultivation with Neerattiper (giving with water as a water right) is seen even during period of Mahabali, King of Mahishmathy and Kerala. Therefore, it is not accidental that after praising God in the first 10 kurals Valluvar starts his praise of rains. He says by the knowledge of the one who knows about the rain and cloud, the rains come in correct order and sustain the world of existence (as the praise of Rishabha in the Veda, and the relation of food and rain as in the Geetha 3.14). He says knowing rain as the amritha (nectar of eternity) is wisdom. The people who eat food, the food they eat, the produce they generate from the ground as food, and all food is by rain only and therefore rain itself is food. Self-sufficiency of food is by agriculture and agriculture is by rain. Puranaanooru has said (18.21) the importance of land and water in food production. Kural said, if there is no rain, hunger will weaken the world, even if it is surrounded by water of the oceans. In kural 13 he uses the term Viyan ulakam (Viyyan or

viyyam being the lake of Ponnani is very important in that usage). And in kural 22 also he uses this term for the world. when

monsoon fail famines occur. In one place reasonable harvest and in another drought can happen. This has to be known by a unified welfare state to tide over such crisis by sharing of food. The potential for mishaps should always be foreseen and consequences of failure of a monsoon is known only by long years of experience ,and only such people can take measures to prevent famines. This was what was done by ancient Indians .The temple of each chieftain had granaries enough to feed entire people of his village and beyond as sangham period guilds show. The granary of Mohenjodaro show this foresight .

In kural 14 Valluvar use the ancient terms Uzhavar and Eru .He says if ploughmen stop agriculture due to lack of rains ,they get laziness and weakness and the plough is the prosperity and economy and strength of an agrarian economy.Eru is a pair of oxen and in the word Eranad this term one can see.Akananur (193.2)also express the same view.

Kural 15 say ,if no rain we are ruined .And good rain give prosperity. The rain revive land that was left uncultivated for years .The excess destroy too the crops. If clouds do not pour not even a blade of green grass will come out of earths womb. He says in kural 211 that a good man's service to society is compared to the nishkaamakarma of the rains .Not only the land ,but also the ocean is thinned when there is no rain ,and its produce like fish,pearls, corals etc disappear or lack lusture.In India ,people knew that if rains come in April May the pearl formation and pearl culture suffer and the conception of pearl in the conch in Oct Nov is prevented (In vasantha no rain should fall, and in Oct Nov or Sharad rithu it should fall so that a drop enter the conch on swathy star to become a pearl within.).Paripaadal (20)also mentions about this relation of rain to pearl .Thus ,even pearl trade suffer and economy suffer with untimely monsoon. Without rain, no festivals, no

pooja, no offerings for deva or for guests etc .Both daana and thapas will disappear from earth if there is no rain. Without water no life is possible on earth and dharma depends on rain and water.

Kural 25 gives the name of Indra as the king who is witness to the greatness of the Sage who have controlled the five (senses). The Vedic Rain God is the only name Valluvar has used in his whole treatise. (He mentions story of Vishnu measuring three worlds with feet but without mentioning name) He says the deva on earth are the anthanar (Brahmins) because they are the ones who know Aram or dharma and does not hurt another jeeva (ahimsa) and are compassionate (Kural 30). Am+Thanmai and Chem+thanmai are used in this kural. The first as compassion and ahimsa and the second as himsa .He asks people to do good deeds in whatever way possible, in all places, and all times and in all ways possible and it is the ideal philosophy of the Chantron (ideal virtuous man). This is the way of the Aryaputhra in all walks of life .(The civilized individual).

How do we do service to people?

1. Ascertain the priority needs of the people.
2. Satisfy them with personal efforts and financial and other service contributions
3. Mobilise the community's thinking ,resources and will in that direction
4. Make the profession /vocation a live opportunity for service in your immediate surroundings and geographical area.
5. Promote international good will and understanding

If there is no selfishness in mind that will be the best dharma .This Nishkaamakarma is the keystone of Krishna's as well as Valluvar philosophy(kural 34)and is also reflected in Proverbs (22.11)and Mathew(5.8) in Bible.

The Grihastha giving food to sanyasin,to poor people who are hungry, and to ancestors ,elders who are unable to work is the friend of all ashrama and all varna and all beings and is doing the best dharma.(By doing the panchayajna).Aimpulathaaru is the word Valluvar used in kural43.Periyapuranam (26)says:-

After dividing the total income into 6 parts a man has to give one part of it to king as tax (kings due)and the rest five is for daiva, pithru,athithy,relations and society and for oneself in equal quantity.This was the customary revenue and the way of life of all people. It is this that was changed by the foreign rules all over India. In Holy Koran(Ch 2,Rukoo 9)we find that riches should go for parents, near and dear ones,kindreds,orphans needy and way-farers.

In kural a person who lives an ideal life with dharma is the Thala(head)or chieftain of all others ,the leadership is only for him.(kural 47)Thus the term Thala,as head ,or chief leader and place of such people is called Thalappally,Thalassery etc also in South India.

Kural 50 says “Vaiyathul vazhvaanku vazhpavan vaanurayum theyvathul vaykkapedum” One who lives a good life in Vayyam with dharma,becomes a God among the heavens.(Bhoodeva).And the role of a wife in such sahayajna is important as Valluvar says ,even if a man has everything else ,but a wife without control of five senses and culture he is living a life of poverty.The real kaappu(protection)of a woman's chastity is not fort or army but her own mind and her Nishta to follow swadharma.As a heroine of

Shakespeare said” My chastity is the jewel of our house bequeathed down from many ancestors”. Proverbs (31.25)also say this.Kambaramayana asks(jatayu:uyir 144.57)who protected Sita’s chastity? Was it Janaka’s good deeds?Rama’s dharma? Or her own protection of chastity? The answer is obvious. Sharing a life of pain and pleasure, adversities as well as good days alike a woman does her sahadharma not only in family life but in all his vocations, and in the yajna and in the next world .If a wife is not upto the mark ,a man cannot walk proudly as a Rishabha among people and he will be slighted by all who knows him, because of the noncultured uncontrolled habits of the wife .(Eating ,drinking ,and involving in bad words etc she brings shame on him).Thus a good cultured civilized wife is the auspicious life and good children are jewels of such a ideal wedlock. Urals 81-90 is on hospitality and feeding guests and needy as dharma. A great person who does that is called a vallal with same dhathu as valla/valluva/vallabha etc

.Kural 87 specifically says the worth of ones hospitality is measured by the quality of his guests. Hospitality is a velvi or yagna,as Athithiyagna in 5 mahayagna.From Babylonian,Sumerian ,Assyrian IVC times the perfect measurement and balancing of weights and measures is well-known among Indians. During Mahabali’s reign there was no false balance or false measures is mentioned in Kerala stories.Thiruvalluvar in kural 118 says to hold the scales(of balance)even and fair is the ornament of those who seeks perfection in their rectitude. This is justice of equality in all affairs too. Not only in physical balance but also in mind free from bias or partiality and words free from envy or selfish motives etc.Kural 120 says the tradesmen guard other people’s interest as their own ,and thus their trade flourish. And in Aihole inscription of the guilds also we find this idea expressed. Honest dealings as best policy in trade was not a lip service but day to day practice of dharma. This commercial ethics of agro economy of India was lost over the time ,first in North India and then in South India by

submission to the rules of foreigners The focussed dedicated disciplined life of traditional dharma was replaced by new rules.

Kural 134 says a Paarppan(seer/Brahmin from which word the Parappanad is derived)if he has forgotten his scriptures can read up and regain but once he loses his right conduct he is losing his birthright(Janmam right of dharma) or Pirappozhukkam.Social cooperation is hallmark of Valluvar's principle of dharma. He says good men produce wealth industriously so that they may dutifully use it for benefit of society. And only those who live with such social co-operation has lived a perfect life and others are as good as dead. He is compared to a village drinking water source getting filled up with rainwater as and when more people use it. It is like a fruit tree giving fruit to all in the village. And like a healing drug or medicine for all ills of the society. And even if the resources are small, people with knowledge of dharma share it with all. The worst misery such a dharmic man have when he is deprived of wealth, is that he cannot help others as before.Valluvar says even if social co-operation ruin you economically it is worth embracing at that cost ,because it is better to be ruined by co-operation rather than live a life of non-co-operation with society.(Kurals 211 to 220 are on social co-operation).kural 221 distinguish daana from investment done for a return. It is more blessed to give than to receive for a yogin and for a dharmishta.(Bible and Koran also admits this).Only a noble mind can do daana even if it is risky as Mahabali did. The great people who feed the poor are investing not in physical wealth or returns but in the everlasting heavenly rewards .The one who shares a meal with the needy do not suffer pangs of hunger .Those who hoard wealth by unfair means and do not give it to anyone, does not know the happiness of giving, and their wealth is lost as they have come. It is transient. If a poor hungry man is wretched, the man who close door on his face is more wretched .The fame of a person who helps sufferers and poor will be greater than all the scholars and literary and musical

giants is the opinion of Valluvar. Legendary figure of Paarivallal is an example. Paari was a person who lived in Cheranad. The value of compassion is stressed by Valluvar and he says that if everyone stop meat eating no one will slaughter animals for making a profit out of it. (Kural 256)

All these are under dharma-sastra. The Arthashastra (politics or economics) of Valluvar is as follows:-

The kingship and Govt or State has six necessities. The army (Padai), the people (Kudi), the food (Koozh), ministers (amaichu) allies (Natpu) and fortress (aran/aranmanai). The king should have some qualities and training to obtain these qualities. In the practical realistic economics of Valluvar is the underlying moral ethical tone of the Arthashastra of Bheeshma, Krishna of Mahabharata times and it is absent in the 15th century Machiavellian Prince. Time and place management is dealt with by Valluvar. The society in which Valluvar lived must have been quiet informed and learned from his treatise. The absolute value of honor is never forgotten even when dealing with the material aspects of life is reflecting the values of the society. Aracharul Eru (Rishabha among kings) or sometimes translated as the Simha among kings (Nrisimha) is having the 6 wealth as Valluvar says. Such a king was equated to Lord Vishnu by Thiruvaymozhi (34.8) is significant Kulasekhara being a Chera/Walluva king.

1. Army in appropriate strength and variety (Chathuranga)

2. Treasury/Nidhi with all necessary resources for expenditure in normal and in times of adversity like famines etc to provide food

3. Able, experienced, learned in statesmanship to advise king, without fear or favor should be the ministers.

4.The allys who stand by king through adversity and prosperity ,honestly ,ready to give up even ones own life for the sake of king and nation.

5.The people who are just and learned in all affairs of state and able to decide in village assembly what they require, what priorities of the kudimakkal are. And how it would affect welfare of entire nation.

6.Fortress for defense .The best fortress is dharma. Then the natural fortress of mountains and oceans and rivers. Structures like manmade fortresses to be used when there is no natural protection. These were existent from time of Ramayanam onwards. Thus the continuity of a culture has to be assessed from scriptures. The 7th organ, the head is the king himself.Kural 756 says the sources of income of state as Uruporul,Ulkuporul and Teruporul.

Uruporul include the dues or tax paid to treasury by people the tax rate of 1/10th ,1/6th,etc.Also the treasures which come in ships (uru)without heirs or in a storm etc.Ulkuporul is the ulkam and sulkam (chunkam)as duty of transport customs.Teruporul is the tribute from a vanquished king, seizure of that kings assets, as a legitimate acquisition for payment of the army etc.

The word Koozh for food covers all varieties of food articles as resources of the nation and it is on this the agro economy is based to feed all citizens and to make profit from the excess produce. In a political game we find dishonest change from one side to other for power gains. This type of friends or allys make the kings /rulers Govt weak. So too advisers who always try to please by saying untruth also is bad for a ruler. In Mahabharata the worth of Vidura was that he always said fearlessly what he felt aboutthe partiality of the king though it displeased him.

Valluvar says the rulers should have courage,generosity,knowledge and perseverance in boundless measure.Alert,learned,brave rulers/leaders are needed in all regions. A king without Dharma will not be able to acquire wealth, develop and guard it, for

equitable distribution of state expenditure and public good .(kural 385).Rulers should be accessible easily to public and should be kind and use only good words to them(This is important in our present day too).Only then he get public support. To such a king the people willingly succumb and support. Only by performing such dharma of the land the ruler become worshipped as God by people. To a king who is just, patient and impartial and have forbearance all world rally under a banner.(K 389)This was the idea of a unified nation under an emperor in India. The light of a king are his kodai(giving away as well as umbrella both seen in the Kodainadu of Valluvanaad of Chera kingdom of Malabar) Chenkol (justice)and concern of the Kudi's(peoples)welfare.(Prajakshema in scriptures).The one who has these symbols is called The Udaiyaan(one who has) or ruler of that region.(K 390).The divine light or thejas which gives a status of king or ruler is thus generosity,graciousness,dharma or protection of justice without partiality and concern of peoples welfare. Each king aspired for such qualities and educative system was designed for this purpose. The learning shape ones conduct and therefore education and a Guru was given priority in the system.En(Number)and eluthu (letters)are two eyes of humans for making a best life. The seers or people with eyes are only these people with and ezhuthu as their eyes. The eye of others is not eyes, says kural(393).Thus Paarpanar (See paarpanar anghadi,Paarappanaadu etc in Kerala kings traditions). To bow before such Udaiyar(who have knowledge)is to learn from them and improve life.

Valluvar mentions sand which gives water as one digs .

Kural 396:-Thottanaithu oorum mantrakkeni maantharukku

Kattranaithu oorum arivu.

As one digs deeper into sand more water comes out. Similarly as one learns more, knowledge is deeper and wider. Learning in this

birth stand him for next 7 births (K 398) and the learning when it makes others happy ,one is prompted to learn more and help more. In this way the pursuit of learning continue.Valluvar compares the ignorant to a barren land which does not give any yield to be counted fertile(K 406).What is the difference of the learned from ignorant?Valluvar says the difference of man from other animals. (k 410).Therefore listening to the wise is the most sublime wealth. Wisdom is the best wealth for Valluvar .The wise man love entire world with constancy unlike a bloom that opens and closes frequently(K 425).This is seen in Bhagavad-Gita (7.8-9)Only men of wisdom foresee what is to come and are prepared for it .The ignorant know not what is ahead of them and are caught unprepared .(427)Therefore wise are not afraid of any adverse situations .They have already read the signs of it (foresight)and taken precautions against it so that the people are saved. The wise do not allow even a small blemish on their character. They avoid even millet-sized(Thinai size)fault in their mind as if it is great as a Palm tree(Panai).Thus is purest of mind and intellect.(Sathwik as said in Geetha).Because such small faults can accumulate and ruin ones wisdom. The life of one who do not foresee ,is like a haystack in advancing fire.So,a king who judges fault /adharma in others should be faultless .Miserliness, amassing wealth without giving or sharing it to others is not just a vice but it is the worst vice and such a person find his wealth declining and vanishing(K 437, 438).Another wealth is having good people as friends and councilors(k 441-450) and avoiding bad people to enter the circle of friends and councilors(451-460).Because water will take the character of the soil through which it flows. Men's character is likewise altered by the associations they make.Kurumthokai says(40)Chempulapeyal neer pola.The water in red soil take muddy red color easily. Crime by imitation and crime by association happen when one associate with bad people. The perceptions of a mans mind are belonging to own mind. But ,the nature of a man can be assessed by the company he keeps(453).In fact the knowledge and dispositions which look like arising from

ones mind are stemming largely from one's company(454)and this psychological knowledge is needed to have association with sajjana and dissociation from durjana .Purity of mind and of actions spring from purity of associations. The pure minded leave behind a progeny of pure minded. The efforts of the pure minded will never fail. They will succeed. The purity of mind not only gives spiritual growth but also material and personal prosperity and good associations leads one to glory. It gives strength and support in all actions and dharma. Actually this is the reason why the friend(husband/wife) in a family life also was selected from a good lineage of dharma.Kural 460 use the term Thunai(help/mate) for an associate.

What is forethought for ultimate success?

Here Valluvar gets to Arthasastra proper after his introduction to graihastra and Raajadharma. There are 3 elements for each action to be considered before it starts. The risk of loss ,the possibility of acquisition, and the ultimate return as value. For one who considers all these after proper consultation with his honest friends and sajjana associates there is no failure. The wise conserve what is already gained.(Protection/Sthithy).Only after that they enter a risky, doubtful enterprise. No one venture into a project without full deliberation and a clear decision .To have an ill made project plan facilitate loss of what one has already acquired and therefore the wise draw a well designed action plan .Valluvar says doing the forbidden and not doing the obligatory both leads to ones ruin. The action should follow analytical decision, resulting from deep deliberations .The action plan that has no systematic planning will fail even if there is a majority support (as we see in our present elections) according to kural 468.If we do not consider the public welfare all our plans will be ruined which is important for public relations in a welfare state

Valluvar Strategy:-

Decide how much resources and power one needs to carry out a project.

The resources at disposal

The strength of it and of the allies

After studying all ranges of possibilities ,related problems launch project.

Concentrate on enterprise fully

Then nothing is impossible.

Overestimation of resources and strength is not good for success of project. Even the weight of a peacock feather can break the axle of a cartwheel .(overconfidence and over exhibition of power is not good).A parallel in English is a last straw that break the camels back. The one who climbs to the thinnest branch of a tree and attempts to go further fall and perish. Therefore measure the income, and give a part as dharma(charity work)and live a life of dignity. If the channel of inflow is narrow and small ,the outflow should not be disproportionate.(Kural 478).The sources of income and expenditure to be balanced well is the idea. If there is ample resources and if the enterprise start at right time the rewards will be good. Tying up operations to seasonal variation is the rope which binds us inseparably to prosperity.(K 482).This is very important in all matters of economy, especially in agricultural operations for a good produce without much risks of loss by natural calamities. Thus right means and right time is important in agricultural economy (in all economic pursuits).The right place for action also is important.(K 484).For growing paddy one has to choose the soil, climate best for paddy. Similarly for each crop. When the right time comes, act swiftly, and with a sure aim (K 490).Do not

waste time when the right hour and opportunity comes. Act quickly and make produce necessary for sustenance and sharing with others. this policy of agricultural economy is important in Kerala and India (generally) which depend upon monsoon rains for its produce and for overseas trade from antiquity. Kural 496 says the four wheeled chariot is not of use in the sea and the swift sailing ship is not useful on land. Therefore every kind of transport should be planned for the produce to be used in a particular medium and used to maximum benefit of gain, with minimum loss. There are four tests for efficiency of an executive (administrator /king) .they are on Dharma(virtue), wealth(artha) Love(Kama) and fear of death(Courage to face adversities).

Thus choose a leader with a good background ,free of faults ,sensitive to public censure (K 502). Valluvar also says from a good family (Kudippiranthu). Kural 794 also says the same. When you select the leader ,weigh the persons worth and his failings fairly and choice made if good prevails.(This is a democratic method of selecting a King by the people and the assembly of people which was there in India as we understand from Ramayana times).Have we this faculty of selection in modern India is to be debated seriously .The deeds of the individual and his behavior alone will be the touchstone which determines ones greatness and littleness.(K 505). Perumai and Chirumai are words used here for great and small. It also mean the elder and the younger.(The words Perumaal and Cherumaan or Cheraman coupled thus is the younger Great King of Mooshakavansa The elder one being in Mahishmathy ,the banks of Narmada ,and younger one in West coast including present Karnataka and Kerala). Choosing councilors, ministers etc should be with utmost care and impartiality and good and learned men with impartiality alone should be selected(K 506-507). One who chooses a stranger without testing his ability as well as honesty and impartiality, into administration is causing endless trouble to posterity (508). Trusting

untested strangers and doubting tested honest aides also leads to such destruction.(510).The good performance of public service is a test of good leaders. He should be able to (512)

- 1.Enlarge resources of income
- 2.develop wealth of the realm in which he is in charge
- 3.Overcome and find solution to all problems that arise .

The criteria for proper selection are :-

Affectionate loyalty, a discriminating mind,decisiveness,and freedom from desires. With these, the person should also be a man of action .Work is to be entrusted only to people with expert knowledge and painstaking application and not to ones favorites (515).Therefore before starting a enterprise, think of the nature of the job, the suitable men for it, and appropriate time and place for it.(516).After making such a decision that such and such a job can be done by such and such a person competently and honestly ,with the available resources ,he should be left free to do it by himself .(517) This is delegation of power .The delegation promotes motivation. The freedom and flexibility is a way of decentralizing power from the emperor /chief executive to subordinates/people. But the Emperor/Chief executive does not loose all responsibility. He has to do

- 1.Tests and checks in the field of activity of the subordinate, inspections periodically to see all works well
- 2.statistical checks
- 3.good will, performance and acceptance as prevailing in people being checked .

Thus central and peripheral systems work in harmony based on a common goal and dharma or ethics .Both have responsibility to the job and to the people and nation alike. This can happen only when all are united by a common code of dharma. If this dharma prevails everything in the nation will automatically be straightened out .

Appropriate contact with the honest and affectionate people who give support is part of a successful ruler.(522-23)If he have no such intercourse he is like a lake without bunds getting a bountiful supply of water.

Kulavallaa kodu intri neer niraithan :- shows the knowledge of construction of a bund (Kotu/kolu)for lakes for irrigation. Chutthramthazhaal or looking after the community or the society/tribe is like protecting water with a bund for productivity .Thus public intercourse and co-operation in agricultural field of Kol with bunds protection is related in the two kurals.A halfway between state communism and individual capitalism is seen in this strategy of co-operative farming industry is noteworthy. From Kural 524 we get the nature of Kulasangha or agricultural guilds of ancient India.

The tribe of a man (with an elderly experienced leader as chief) surrounds him and establish social contact with all, and result in prosperity of all together(524)..The generous chief with a kind word attract all his kinsmen as allys.Thus loyal people surround him in all times, even in adversity.(Saama and Daana are used by a good leader .)The crow when it gets food ,call all its community to share it, before it eats. the good chief is like that (527).He gives first and only then takes is share. He treats according to merits and demerits the people of the assembly so that everyone strives to be meritorious. Special services are rewarded by titles and awards .If someone leave you, find out what the reason was ,and correct it and get back that ally is a good advise Valluvar gives.(529)When

such people who deserted you come back ,test them before taking into confidence ,but do not reject summarily.

Arrogant thoughtlessness is a worse enemy than anger to a executive. A false sense of security and overindulgence in pleasures result from that. One has to be ever watchful and thoughtful .Vigilance and bravery are more important than a fortress in defence.Negligence can lead to disasters. Therefore listen to works of wise people and do swadhyaya ,learn always, be watchful and vigilant and dharmic in all deeds and words. Just as people look at rain cloud for sustenance, they look at rulers for justice. Therefore,

Anthanar noorkum arathirkkum aathiyaay Ninrathu mannavan kol.(543)

The ultimate basis of Veda of sages and dharma of the wise ,is the straight unfailing scepter(symbol of justice)of a good king.Kol is the word here for justice, for balancing ,and a measure, and a scepter as symbol of justice.Chenkol,Thulaakkol and Kol fields of the king (the law and order, the weight and measures, the wetland paddy as food)all comes under the guild of a kulasangha of learned Anthanar (Brahmana/Brahmakshathra /rajarshi as chieftain of a tribe).If the ruler is such a just and wise one ,all wishes of people being fulfilled justly under him, the entire world will be at his feet.(544).Then seasonal rains and rich harvests will attend him .(545).It is not weapons which give victory to a just king but his Kol (546) or natural justice and corresponding prosperity from the land blessed by seasonal rains to give all fruits .The person who protects dharma, is protected by dharma.Valluvar compares destruction of bad people who are harmful to dharma ,to weeding of fields for growth of good crops(550).Kural 551-560 is about a tyrannical king who is destroyed by his own actions. The lack of a compassionate ruler is compared to lack of rain clouds leading to dry land with no greenery (557).Under a tyrannical regime ,according to Valluvar ,it is the haves (rich)who suffer more than the have-nots.(558).They are deprived of all that they

had ,because the tyrant is after their wealth and ignore the poor. This was the foresight Valluvar had about the Landlords and kings of India ,which happened under the foreign rule. It was they who lost all .The have-nots remained as such .The haves lost all .If king is not just, rains fail, famines come, cows yield less, Brahmins loose intellect and forget their Mantra and knowledge(559-560) and all these happened as Valluvar foresaw it in BC 31.It is interesting how Valluvar compares a dharmic king to a good music.

Pan en aam paatarkku iyaipu intrel Kan en aam kannottam illaatha kan.(573).

Tune,expression,words ,of song etc should be in perfect harmony. To have an eye without compassionate graciousness is like a music with these in disharmony ,and total imbalance. The integrated quality of music as well as the king is in its compassion.

Valluvar has identified intelligence service and arthasasthra or literature on state-craft as two eyes of the ruler.(Ottrum urai chantra Noolum).This is in conformity to the old Sanskrit texts also. What was the need of a intelligent service or Gupthachara?To know whatever happens to every one in the kingdom, at all times and necessary steps to be taken for help or for prevention of disasters. For this a wide network of Gupthachara are employed. They cover all, including kith and kin of king in their watchful eye. They disguise as sanyasins,holy men, get access to all places and collect information without arising any suspicion and protect secrets even under extreme co-ercion (586).They have inner sources of verification of such information collected and present only after full confirmation. A system of countercheck was there. The balanced statecraft of the times should be understood from such statements of Valluvar.The spys should not know each

other. If three informants say the same version, there is reliability of information and action can be taken. But the open reward is not possible for a *gupthachara*, since that will expose him to public eye and his job will suffer.

What Valluvar says about laziness is noteworthy. He says a person/administrator who has no laziness will gain the entire universe, which was measured by the three steps of Lord *Thrivikrama*. That is the story of *Mahabali*, King of *Mahishmathy* and of Kerala during *Vaamana* Avathar of *Vishnu*. And the rule of *Adi alavu* (measuring with feet the time space in astronomy) *vakya* is famous in Kerala tradition of astronomy. Lack of laziness and human effort in achieving great deeds is praised. The great works are finished by the strength of perseverance. And such works are for benefit of others too. Social service or *Velaanmai* is with distribution of what is needed with a sense of duty to those who deserve it most (*Thakkarkku*) as said in the *Geetha*. One who is committed to a cause and do not go after sense pleasures is the pillar of strength for people, for society. Industriousness brings prosperity while laziness brings the opposite. The elder sister goes with the lazy and the younger, the lotus-born *Lakshmi* with the industrious (617). There may be limits to one's intelligence, or its outcome, and one may call it fate or Luck. But with whatever available knowledge, failure to apply that knowledge for work and for social welfare is blameworthy (618). Thus practical application of learning, *gnaana* is needed for all people and no one can escape from not exercising the will power to make it to good use. Then Valluvar says (619) even if *Daivathan* (God) or providence is not helpful the personal efforts will bring its fruits (*kooli* or salary/fruit of action). The result will be proportional to the effort. Reaction has to be proportionate to action is a universal law of *prakrithy*. With hard labor and ceaseless industry people are able to overcome the fate (*swabhaav* of *thriguna*). This *kural* (620) is just the opposite of *Kural* 380 which states that destiny is supreme and even with planned efforts to overcome it,

one has to experience its effects. How is these contradictions conciliated? The 380th kural is saying that karma determines a mans disposition and predilections in present life .620th say human beings have options either to take the line of least resistance and let it go like that or to overcome pre-determined obstacles with a dominant will ,discerning knowledge and persistent effort which could make all the difference in ultimate outcome in a particular set of circumstances. Even though the result may not be 100% what is desired one can reach a near enough objective.

Geetha(4.37)say fire of knowledge reduce karma to ashes and Valluvar say a matching will and industry could complete the process of victory over fate and that is what Nishkamakarmayoga of Geetha also teach us. Therefore, there is no contradiction, though seemingly contradictory. Conciliation happen when we understand the meaning properly. If not, the controversy will lead to a theoretical jargon of confusion which is of no use to anyone.

Fortitude and power of endurance in face of all adversities is a great strength and a strategy to overcome it. Kural 622 says ,even if a flood or deluge comes with all misfortunes, the wise can overcome it with his right thinking. Whether Shakespeare got his expression” Taking up arms against a whole sea of troubles” from Valluvar has to be thought of. If one can look at misfortune with a smile on his lips and face it, one can overcome it is Valluvar theory. Such a person with fortitude is compared to a brave bull yoked to plough, who breaks all terrains that it traverses up or down, desert or swamp.(624).The tenacity of the bull in preparing the hard ground ready for next produce is compared here .To understand that misfortunes is the law of life and to know this and to be not perturbed is wisdom. Then one can face it with unflinching equanimity. Adversity is a challenge for survival and know our circumstances and plan ahead and face when it comes.

What all should the advisors or councilors of a wise king know?

Karuvi(instruments/technology),Kalam(time/seasons),cheykai(the methods of performance)cheyyu(the act or function itself) aruvinaï(all its pros and cons)should be analyzed by them. He should have 5 traits:-Resoluteness, concern for welfare of people, study of statecraft, driving energy. He should be able to reunite antagonists, cherish existing allies,disunite allies among the enemies.(except the last said all seems necessary from my point of view.)This is for the unity and co-operation and leadership qualities of the ministers is a must for it. The minister assess everything in the country on a action-oriented basis .The success-oriented action plan of a minister depend upon his learning. Every subtle knowledge about the country should be known to them if they have to take a successful action .They should know their country, its tradition,geography,strengths of agrarian and other economy traditionally and various measures of improvement for increased production, welfare of people etc and the defense of the nation. Not only book learning but practical knowledge is important (637).The art of persuasive speech, oratory and communication power as part of leadership quality of ministers is ascertained by Valluvar.It should be logical and convincing to listeners

.Kural 644 says “no greater dharma or worldly benefit can accrue ,than by suiting ones speech to the assessed intellectual level of the audience.” The target audience determine the standard of speech of a yogin .This is a principle of management and public speech of modern times.In debate convincing style, good memory and fearlessness are important. Profound ideas can be expressed in simple language in orderly fashion. A unfocused question can bring an unfocused answer. So ask what you want to clarify in simple short structured question. You will get structured focused answer if the student know answer. If they don’t know no beating about the bush is possible. So a discussion if it leads to beating about the bush means the opponent is simply showing off that he knows everything and actually doesn’t know anything ,So the best answer should be a golden silence .To people who are

squeaking without an aim, and to purposeful arguments to belittle one, what should one do? Do not go into waste of time by arguing with them is the best advice Charaka gives .That will reduce confusion. And will save your time, energy and health. To go into meaningless argument with such people is detrimental to ones reputation also.

So what are two steps a wise advisor give to a person who start an enterprise?

1.Avoid all ill-considered actions

2.Once an action plan is agreed upon after proper discussion of its pros and cons and its risk etc,embark upon it and be ready to face all problems that ensue.

Life is such a project which has to be faced both in pain and pleasure, in gain and loss alike. An efficient wise man disclose his purpose and action plan only after completion of action and its success .premature disclosure can lead to many problems.

Kataikotka is the word used for final disclosure by Valluvar.

Make a plan, speak about it. That is an achievement. But a greater achievement is to accomplish the plan as stated and then speak about it.(664).The man with a willpower(Ichasaakthy)makes a design or plan of action, achieve his objective facing all adversities and he is an efficient leader(666).Do not insult men looking at their stature, because an axle-pin(Achaani) is essential for function of a mighty temple car. Thus all people ,whether small or big, rich or poor were given equal importance in the management science of ancient India .And that was the reason why all were satisfied and there were no rebellions in distant past ,one should think.Kural 669 says programmes ,which increase happiness and peace of all beings or subjects ,should be pursued with a willpower and continued even against all hazards. This is the ultimate hallmark of success for Valluvar ,just as for Srikrishna in the Bhagavad-Gita .

Once a decision made quick implementation is needed(671-672).There are two types of actions:-

- 1.Which can be done at leisure ,implemented slowly as along term plan ,slowly, deliberately
- 2.Things require prompt quick actions which cannot be delayed or put off even for a Moment

Agricultural pursuits have both these limbs of action. Before commencing an action, it is wise to consider in depth the objective, possible obstacles, benefits and risks and reactions after completion .(676)To do a job advise from an experienced one with expertise on the subject is essential.kural 678 say one successful plan will lead to another as with one elephant ,we capture another elephant ,which again shows that Valluvar was aware of capturing of elephants in the Chera country. The 677th and 678th kural read together mean that one should learn expertise from an experienced person and use it by hard work and industry to reach heights of success and become a model for entire world. Japan had done this in recent years. If one wants prosperity to ones country ,one should create a peaceful atmosphere for carrying out all activities of production, trade and commerce etc.Selection of messengers and ambassadors to courts of other countries and the diplomatic qualities of such messengers are dealt with in 681-690 kurals.

Valluvar says the speech of a wise man in an assembly is like the channeled water to grow living plants. The word chorinthru indicate the correct amount of water being channellised in right manner through proper channel to each field/or plant so that all grow and prosper. It shows the common methods of irrigation prevalent in those times.

Speaking to people who will not understand the intellect of the speaker is like throwing nectar into a gutter.(720)

In a discourse one has to absorb worthy thoughts from those more learned(724).

A welfare state and a prosperous nation:-

To be prosperous a nation need ,(K 731)

- 1.Unfailing harvest (produce for food sufficiency)
- 2.Wise men for giving good advise(men of learning and character)
- 3.worthy men of wealth (good and compassionate rich people who share wealth with others)

The land,labour ,and learning and capital sharing in other words which are organized on a definite basis of dharma.

A country with abundant production and consequent wealth and harvests in plenty unaffected by pests and diseases is prosperous and famous.(732) A great nation bears unexpected burdens with fortitude, and still regularly pay the needed taxes to the King (733).Freedom from famine and epidemics and harassment by others(foreigners/enemies)make one prosperous.(734).Pasi,pini and pakai should not be there for prosperity .This foresight of Valluvar deserves special mention. Because all the three usually come together and make the nation weak and poor but still a great nation face it and come up or emerge again as a great nation. (Which we are witnessing now in Japan, India etc).

Kural 735 says that a prosperous nation will not have warring sects and destructive internal strifes or murderous offences that disturb the peace of the country.Kolkurumbu (motiveless murder) is happening every day in all nations of the world at present and

makes entire world less prosperous. Only if they see reason and come to terms ,peace will prevail. The country which was laid bare by enemies, still do not loose its basic essence of prosperity is the leader among nations according to Kural(736).And kural 737 continue that the waters on the surface of land, rains that fall from clouds, the mountains, rivers and great dharma(val aran) are the real prosperity of a country. Actually the word irupunal is used (two sources of water).The surface and groundwater including. The ocean and mountains as natural resources as well as defence, dharmam and plalace(Aranmanai being palace/fort)for protection is given in a pun in this kural.Piniyinmai(Disease less ,healthy state),chevam(wealth)vilaivu(good harvests)inpam(happiness) and emam(security/defence)are the five necessities for prosperity of a nation.(738)The pleasures are interpreted as social festivals and fares with dance and music for rejoicing.

Kural 739 says the prosperous land gives good produce without much effort, and with rainfall and good soil ,and it is the best. The dry lands where people toil with their sweat to earn a living is not considered as a good prosperous land. The good sign goes to Kerala and Malabar and to Cherrapunchi in Assam then.(in case of India).

Naaatu enpa naataa valarthana naatu alla Naata valam tharum naadu .

But still with all these economic factors and all other attributes of a prosperous land if a land is not doing well it is because the ruler is not good and efficient(740).This is what is disturbing when we think of Kerala.Kerala has all signs of a prosperous land and if it is not yielding good produce the rules and attitudes of the people are to be considered thoroughly to find the real cause for this failure.

How the ancient kings colleted revenue ?Valluvar say(755)the wealth is collected from people when they give it with compassion and love .The king should not collect it without their willingness. The ownerless property, custom duty, excise duty ,prizes and

tributes alone belong to the king absolutely(756).Along with this 1/6th of produce which people give willingly as revenue for protecting them goes to kings income.The position of one who makes wealth (an entrepreneur)with plenty of financial backing is compared to a person who ascends a hill to see a elephant fight on the level ground.(safety and security if there is good capital behind).Valluvar thinks that in great adversity only a honest traditional army will serve the king and the new ones will run away or make benefit by frauds. He asks what is the use of having an army of rats which dismantle with the hiss of a serpent? The good honest army does not desert or disgrace and maintain traditional valour in all situations.(Such an army of Valluvakonathiri as Chaver army came into existence against Zamorin during Mamanka means ,such people were present in Valluvar's time also. Was he one among the army chiefs of such tradition? It looks like so. Because 771 is a kural of such a chief addressing a prince insulting a cheifton/king .It says:-Do not challenge my leader .Many have challenged him before and now they have all become stone statues.(about the memory stones of warriors as Veerakkal in Tamil speaking countries).For my leader the word used is "En Ai" as laid down by Tolkappiyam.(Aiyyan/Ay).About enmity within a guild or tribe Kural(881)say even a shady grove and inviting fountains will be bad if they breed diseases and equally dangerous are treacherous kinsmen and friends within a kingdom. How internal strifes ruin a nation is described in detail by him. Even if the treachery is only the measure of a sesame (ellalavu)since it is from within it is dangerous is his view. He also says men who are ruled by wives (by fear of her, acting according to her words ,and are infatuated with wife)will not be able to do something great for society ,though he may achieve some personal wealth and fame .Because he had lost his greater dharma he is looked at with scorn by others. It is a shameful evil for a man of worth according to Valluvar to be obedient to wife and neglect social duties. The man who is afraid f his wife is a wretch who does not get salvation

because he fails in doing dharma. He cannot do a good turn to even a deserving person for fear of his wife and her harsh words. They pretend as Gods of bravery but people will not respect him. Or even if he lives like a God ,with fame, wealth and luxuries ,he never gets acclaim as a good person. A modest womanhood is to be praised more than such a manhood. The man who is a slave to wife will not do justice even to his honest friends and to society .He will do the wife's bidding all the time .He does not get love,virtue,or anything at all .The woman who love for wealth of a man will only be a ruin for his dharma. The people who sell dance, music and body for money are alike in Chilappathikaram (3.8.9).The enemies of a good man are woman who pretends love for getting his wealth(Irumanappen or woman with one in mind and doing another)playing dice and drinking alcohol. Therefore one should avoid these for a dharmik life.

A kavariman or yak removed of its wool prefer to die than live. Like that is a honest human being of good ancestry who will never part with his honour.In the Cheraman Kanaikal Irumporai,a chera king sang(Purananuru 74) when he was imprisoned and slighted by a chola king that he preferred to end life than suffer such slight within a prison.A chantron (gentleman)is having 5 qualities according to Valluvar.

- 1.Compassion for all lives.
- 2.sensitiveness to shameful conduct
- 3.social co-operation
- 4.Grace to all neighbors and beings of world
- 5.upholding truth always.

He may be poor but his innate strength of character makes him rich internally even in that state and he is any day nobler than a wealthy man without this character. Kural 930 says all men have limbs and organs alike but it does not exalt a man to oneness with the great man. Meaningful affinity comes from cultural identity not from the human form alone. The one who serves others with dharma, justice is praised by the entire world as great. It is by such men of good breeding and culture that the world goes on smoothly. But for them the balance and harmony of world would be buried in dust. Accumulation of great wealth in an uncultured man's possession is like milk kept in a unclean vessel and turns sour easily. Wealth not shared with public is a waste. It is a miser who hoards wealth who is born as a demon in next birth according to Valluvar. They are burdens to mother earth. Even with their crores of money they are useless. He is a plague on his own wealth or a beautiful lady who grows old in her obstinate loneliness of spinsterhood (not allowing any one to enjoy her beauty). His wealth is a poisonous tree in the middle of a village, with fruits which no one will eat or relish. The generous man is like a rain cloud and even when his resources finish they are replenished in no time for benefit of mankind.

Food, clothing, and other daily needs are alike for all men but the good man is different from others by his sensitivity to shame. The great people who want to serve the world plan their activity systematically within the defensive bounds of sensitivity to shame. If one breaks rules of ethics he offends his birth. If he acts dishonourably, he is lost to virtue itself.

Citizenship duties:-

Valluvar says (1021-1030) nothing advances one's family prestige better than service to the community, committedly performed till one's objective is fulfilled. Endeavour and in-depth knowledge are the two qualities based on which a community will prosper. When

a person sets out to work for the advancement of family and the community ,God himself will grid up loins and lead him. The efforts of those who try ceaselessly to raise the standards of prestige of their extended family (kulasangha)will be crowned with success even without much planning. The man who shuns inequity and assiduously promotes community welfare will find all the world becoming his kindred.

Kuttram illa kudi ceythu vaazhvaanai Chuttamaaychuttum ulaku.

In Purananuru Poet Kanian Poomkuntranaar say”Yaathum oore yaavarum keleeer”.(The entire world is our home/village .)Manly endeavour in a person of noble heritage involves advancement of his community ,as his personal business and family’s bounden duty. Just as the brunt on the battlefield falls on the courageous, the service to community as a total burden devolves on those who can bear it. Community service need not wait upon season or dignity. Those who procrastinate so ,will ruin their own reputation and the community. The effective reform of society is built upon the consecrated suffering of a few devoted and committed individuals. Such people are ready to suffer any thing (physical and mental)for the benefit of others The kural is “Idumpaikke kolkalankollo kudumbathai kuttram maraippan udambu”and the word Idumpa is significant.If one remember the name of Bheema’s wife Hidumba (in Tamil Idumba) who bore a son for sacrificing his body for community benefit,one wonders whether this Tamil name was given because she belonged to Tamil speaking Dravida country.

Kambaramayanam also say(Sethubandha 53):-

Idumbai ethanaiyum pstutheythinum
Kudumbathankum kudippirantharine

If there is no public spirited people to support it, family and community will fall uprooted ,when a misfortune befalls.(Nallal

illatha kudi is a village where there are no good and unselfish people).

Agriculture:-

1031:-chuzhantrum erppinnathu ulakam athanaal Uzhanthum uzhave thalai.

The world depends on the plough ,more than on any other avocation in life. Despite hardships ,therefore agriculture is the best (the thalai or head of all professions).According to this view agriculturists are the most productive class and the crux of a country's economy. The 18th century France also said this .But Indian agriculture and its ways are unique due to its geographical peculiarities and the monsoons. The Kallaani anicut in Cauvery by Karaikalacholan is proof of the old King's concern of irrigation.

Kalingar said ,after all the wanderings across the seas ,over the mountains, felling forests and wandering over the land ,finally one returns to the constructive toil behind the plough to get his own food.

1032.The ploughing class is the axle pin of the revolving world ,because they sustain all others who leave the plough ,to take to different occupations.This is still true. Whoever makes two grains of corn or two blades of grass ,to grow on a spot of land where only one grew before ,deserves better of mankind and do essential service to country. Therefore Thomas Jefferson called Good farmers as chosen people of God .Dr Johnson called agriculture is the noblest science.

1033.The people who till soil and raise their own food are the people who live by right. Others are only parasites who live upon them. They have to live Thozhuthundu (worshipping for eating) to those who live Uzhuthundu(by plough).

Proverbs(2,11) say He who tills his land has enough to eat But to follow idle pursuits is foolishness.

1034:Palakudai nezhalum tham kudaikkeezhkaanpar Alhaku udai nezhalvaar

Note the words Kudai and kudai twice in this. This is a description of the Kudainaadu. It says the green fields waving in fullness with sheaves of corn surely bring all countries around it, and under its umbrella. This is true to every word as we know from history of India. All the foreign people came to India hearing its prosperity, its culture through the seafaring people of the western shores and reached Kerala first. Kodai nad was the seat of the Chera king and a person from Valluvanad of this Valluvakonathiri is natural to use the word and describe it. The people who eat only the fruits of their own toil, will never beg. Nor will they deny alms to a mendicant at their door. Sharing food is the quality of a agriculturist. Valluvar valued this economic freedom which agriculture confers on a person who takes it up as an avocation. Both land auditors tiller know high value of sharing and giving in abundance. The self respect of never begging and always giving is a virtue of people who produce food. For a person who cultivates land and respects and love the profession the land gives everything. The kings of Chera country and their chieftains were famed for their giving alms and food right from time of Mahabharata war and in sangham literature this is always mentioned. It is this land which is neglected and people are begging at other states doors for their sustenance in the present times. This should ask the question “Why “and a solution for it found .

1036:- Uzhavinaar kaimmadanghin illai vizhaivathoom vittom enpaarkku nilai.

If tillers of land withdraw their labor ,even those who have renounced the world will lose their serenity and concentration of spirit. That is the whole economy will come to a standstill and it should never happen for the prosperity of land .The intellect of the sanyasin,of scientist and of white collar job people depend on food which is produced by agricultural people.

1037:-If the ploughed soil is left to dry to a fourth of its bulk there will be plenteous crops ,without even a handful of manure being put in.Field is ploughed in wet state .The turned up soil is left dry in sun and air ,for considerable length of time ,till the dried up soil is only $\frac{1}{4}^{\text{th}}$ of quantity of original mud turned up ,then that soil does not need any further manure to become fertile. This is because aeration results in absorption of nitrogen from atmosphere. So Valluvar is postulating an ancient parallel to modern principle of effective aeration and nitrogenisation of soil. Adequate aeration is needed for raising good crop. The word Thodippuzhuthi is used here. It is considered as a measure of weight ,also called a Palam in later times. Kacha or kachu in the kural means a $\frac{1}{4}^{\text{th}}$ of Thodi. One interpretation is that thodi is a pound but how this interpretation was derived is unknown.

One palam is a weight. The thodi is a piece of land .Kacha is $\frac{1}{4}^{\text{th}}$ of thodi .Or of one palam .This is a integration of geographical (length,bredth and area) into weight (mass) which gives perfect astronomical and cosmic measurement integration of whole earth in relation to its mass and energy .

1038:-Ploughing is important.Manuring is more important. After weeding, more vital than water management is plant protection.

Valluvar here lists the important steps for a good crop.

1.requisite extant of ploughing

2.manure

3.weeding at right time

4.proper water management

5.protection of crop from pests and diseases.

He has not left out anything of green revolution .

1039:- If the husbandman does not pay personal attention to his land ,like a neglected wife, that field will turn its face away from him in loving anger.Valluvar use the word Oodal here ,the paribhava or anger of love. Or remain sulky and sullen. The absentee land lordship was not probably there inValluvar times and all agriculturists loved the land and their vocation as well as the plants .

1040:-Ilam enru achai irupparaikkaanin Nilamennum nallaal nakum

This good earth(as a woman)will laugh at those who pleads poverty, and sit idle ,neglecting their productive land.The laborers and farmers who complain of poverty when they have this good earth which is bountiful and give in plenty if proper attention is given is considered foolish by Valluvar.There is no land unfit for cultivation .Idleness and poverty go together.

The size and combination of inputs can overcome inherent limitations in any soil. And therefore a man who sits idle and let his land go fallow is an idiot ,who deserve to be laughed at .If we do our share ,the land itself will do the rest .Poverty is dreadfully painful and destroy all honor and refinements of speech and

action. When poverty and famines come ,people neglect studies and revert to disgraceful speech even if born in a family of scholars. The analytical thoughts of people are neglected when people are suffering hunger. This leads to loss of all values and dharma .Even a mothers love is less when a man is poor .People look at relatives as if they are total strangers when they are poor. People who have once experienced poverty ,will always think of it .Kural 1048 says this thought:- The abject poverty that killed me yesterday, Am I to face it again today? Everyday will be a struggle for existence for such a man and a question of sheer survival in face of adversities and he never lives in bliss .One will go to sleep in midst of flames but will never sleep in midst of poverty and the fear of it. He counts each day and his savings to ward of poverty the next day and becomes a mercenary and forgets all other virtues. Thus poverty makes a nation lose honor .people who have to depend on salt and gruel on others sometimes take up to sanyasa only to get a feed (because sanyasins get food .This is what Sankara said Udaranimitham Bahukrithavesham).At the sight of charitable people who are ready to give alms to needy ,poverty will flee from earth. Thus rich people can be trustees of society by sharing wealth in improving society. They used to donate lands and wealth to temples for charity of feeding poor .

Good men share wealth at a mere call while ignoble ones give only when crushed like a sugarcane.(1078).They see a neighbor well-fed and clothed and hasten to find vices in them. There is no use for the world with such unscrupulous men .In case a misfortune come, these people will quickly sell themselves to the highest bidder.

Thus Valluvar described the dharmic agrarian economy which prevailed during his times.

Indian economy from 1500-1800 (European ,Pre-British period):-

There was a restructuring of relational networks to mobilize larger volumes of surplus to meet the needs of the consolidated bulk taxes and cesses into a single charge on land ,assessed and collected in cash except in case of lands under irrigated rice cultivation where revenue claims were in kind. The major changes were for benefit of political authorities and prosperous cultivators especially on sugar cane,spices,plantains more than on food grains. It was favorable to trading communities .The earlier dense networks of local level exchanges ,periodic and daily markets small collectors of rural conducted their transactions were weakened by this and gradually lost. The growth of crafts localized to Gujrat,Coromandel,Bengal because of the sea trade facilities and the political power of Europeans in these areas. The guild of Karkola weavers of Kancheepuram had roots even in remote villages. The nodal points of long distance trade of late medieval network were Aden and Morcha on red sea. Basra and Hormuz on Persian gulf Surat and Calicut on western seaboard.,Pulicat and Hughli on Coromandel.Malaka and Malay archipelago. The imperial capitals were Delhi in North and Vijayanagara in South. They and their entrepots dominated Tran regional trade-In transshipment the Governing by the Imperial capital was honored by all Indian merchants and people. Why riches concentrated on Coromandel and Gujarat coast disproportionately?

- 1 Regional specialization of production was encouraged
- 2 Increased commodification of exchange network
- 3.Patterning of new political linkages

4.Irrigated rice cultivation. Rice from Bengal fed weavers of Tamil Nad .Bengal also gave raw silk to Gujarat.

5.Wet farming and cotton textile production and export

6.Monetary system. Gold mine in Southern peninsula.Silver in North India.Tin, lead and copper coin of lower denomination ,uniformity achieved by weight .

7.In early 17th century India was the major supplier of clothes to S E Asia,Iran,Arab world and Africa.(just like the Vedic and Sathavahana periods)and Gujarat and Coromandal specialized in this. The world system associated with Indian ocean was not yet influenced by the ruthless drive for individual accumulation of wealth.

In rice growing areas enough water and manure from cattle ensured sufficient foodgrains.The fields were separated into small plots to ensure drainage and skilled labor was necessary for maximum production .The agriculturists were skilled professionals and knew how to maximize yields with varieties of seeds suited to particular types of soil resistant to strains of crop disease .The disuse of the old localized markets and continued participation of petty peddlers in long distance trade became an impediment to trade and subordination of artisans by the newcomer politicians of Europe.

There had been two sultanates in India between 1400-1404.In Gujarat on west coast where the princes who abandoned the alliance with Delhi Sultanate came and settled. The other in Malacca south of Malay peninsula whose Raja converted to Islam. It was the same time when economic and agrarian policies changed between Zamorin and Raja of Perumpadappu/Cochin in Kerala .The real reason was 5000 Km apart ,a common cause for transoceanic trade had happened .In Egypt Sultan of Barspay took

monopoly of spice trade. This ruined the merchants who dominated it since 12th century. Their network disintegrated and the benefit went to Cambay and Calicut .In 1433 Chinese abandoned western Indian ocean precisely because of this reason, after 7 expeditions here for 30 years with 100 armed junks equipped for war every 5 yrs .

Malacca is the point at which both the monsoons die down. That means ,at the time when the Islamic and Arab world dominated and China withdrew as a result of this sudden change, the Portuguese was brought to Calicut by a Gujarat born Muslim sailor.All the medieval agrarian kingdoms and economies were traditionally Indian and they started to convert first to Islam and then to Christian due to political gains .The last to convert was Manidweepa(Java)in 1525.With conversions both preachers and traders increased in such areas. The domination was not by foreigners but by Indian –born converts and they took over the network since they knew the trade from their ancestors. In 1510 Goa became Portuguese territory. It became center of horse trade .Both Vijayanagara and Bahmani sultan of Deccan bought horses from Portuguese just as they did before the Portuguese came .

The international sea-route trade was dominated byVijayanagaram. Their trade was concentrated in the following centers:-

- 1.From parts of Karnataka,Tanur,Calicut,Venad and Ceylon to Gulf,Yemen,and East Africa.
- 2.From Bengal,Pegu to West Indo-China,Malacca,Sumatra, Ceylon,Maldives
- 3.Copper from Malacca to Pasei in North of Sumatra was exchanged for pepper .Pepper was traded for Rice for Malacca at Martabam. Rice ,pepper and ginger from Malabar to

all markets along the coast and to Ceylon and all global centers. Spices from Malabar and Moluccas was obtained by Javanese from very early days from primitive people in exchange of rice, glass trinkets and old pots. Rice and textiles from Coromandel and Gujarat .

4.Vijayanagar distributed sugar purely powdered as far as Hormiz and Eden. Bengal sent it in tightly sewn sacks of raw channa or jute and leather .It was sent in black clay pais with vegetable and fruit preservatives as jaggary.Bengal muslin and Coromandel painted silk were in demand and Gujarat had distribution networks for textiles.

5.Cotton and indigo cultivation for dying:- Done in spring in every village. Technique was specific for each village. The fabric is blanched, dyed ,then woven and printed. In Gujarat carpets ,leathers, jewels of agate,carnelian,ivory,shell objects, glass trinkets were specialty

6.Western ocean:- Pepper ,ginger,cinnamon,and rice were exchanged for gold and metals in the distributing ports. Pepper ,nuts ,cloves, nutmeg ,porcelain, textiles also exported.Gold once it reached people's hands remained accumulated in India .Banias and jains (vaisya)were major bankers and financiers /dealers in precious stone trade

In this period the coastal boatmen and sailors converted to Islam .At the dawn of 16th century Tome Pires wrote that Gulf of Cambay in India holds out two arms ,one of them touches Aden,and the other Malacca. The Malabar Mopillas were converts and children of the traders who had children in the native women. These Moplas displaced Nestorian Christians from port of Calicut.They lost the pepper market to the new converts. The

Christian guild existed in rival Cochin in 1503. The rivalry of Zamorin and Cochin Raja was actually a competition between these two rivals for trade supremacy. In 1504 it is Mathias from Kayamkulam who loaded Portuguese vessels. From then on we see two prominent names which historians think is Muslim names But actually they are not. The two names are Cherian and Pate Marekkar. (Merchants, companies and trade. Europe and Asia in the early modern era. Studies in modern capitalism. Ed Sushil Chowdhury and Michael Morineau. Cambridge university press 1999)

Cherian is a Christian name at present. But it actually was a Tamil origin name from Cherayyan, the Ayyan of Chera. And Pate Marekkar means the people who have a pathemmari (a small ship) just like Katta Maraikkarar in Tamil. The Marakkar or the shipman later was taken as a Muslim name because many coastal people and sailors converted to Islam. At this period due to conversion Kerala Muslim and Gujrat Muslim were at apogee of power when Portuguese came. The maritime sailors and merchants were powerful right from Vedic prehistoric, historic Sathavahana times and their trade rights included undertaking military action and seizing territories. That is how the converted Aliraja of Cannanore got Maldives and Andamans from the old ancestors of him. We find during Portuguese time names like Naina Chathu, Nina Thirivanka, Naina Koppathaalu etc involved in Malacca rice trade and textile trade. They were specialized Indian traders in Pegu, Siam, Jawa, Molluccas and protected by Tamil Hindu princesses who were Sultans of Malacca.

The chetty/sreshty trading people in Kerala were active in money trade, money conversion, financing, precious stones and were allowed Pallacku, golden trumpets and brigands and armies just like Brahmins allotted to them by king (just as Perumpataku Mutharaya or the sailors of big ships in pre-sangam and sangham age). This was also given to the new Christian traders by Kerala

kings as we find from historical records showing the equality and justice they employed towards all irrespective of religion and probably their trust in all alike.

We find by 1510 the major centers of Hormiz, Goa, Mlacca under Portuguese and Egypt, under Ottoman Turk, in Iran the Safavid power, and Mughal expansion in India under the two religious converts of sailors the Indian trade and commerce succumbs and thus the old system of Governance also loses its long-lasting co-operation and unity. That is nothing very mysterious and there are no unanswered questions as many people think about how such a long-lasting community of trade and commerce and food sufficiency collapsed suddenly. The networks of economy were lost and financial burden made the unsuspecting people and their kings succumb to the worst which they least expected.

Malabar as seen by Sir William Logan

Sitting in the collector's bungalow in East Hill Calicut, on 7th January 1887 William Logan wrote preface to his volume 1 of Malabar Manual. He wrote:—"In any descriptive and historical account of the Malayali race, -the position, namely, which was occupied for centuries on centuries by the Nayar caste in the civil and military organizations of the province—a position unique and so lasting that but for foreign intervention there seems no reason why it should not have continued to endure for centuries on centuries to come. Their function in the body politic have been tersely, described in their own tradition as the eye, the hand, and the order, and to the present day we find them spread throughout the length and breadth of the land, but no longer—I could almost say, alas—preventing the rights (of all classes) from being

curtailed or suffered to fall into disuse.....To understand Malabar and the Malayali race aright, it is above all things necessary to know this central fact –this distribution of authority – this “Parliament” as it was called so long ago as 28th May 1746 by one who has settled in the country and watched its working –this chastiser of the unwarrantable acts of Ministers of state –this all powerful influence tending to the maintenance of customary observances –should be firmly grasped by the mind”

He continues that Bentham’s dictum of “The greatest possible happiness of the greatest possible number” „the attainment of this modern aim was advanced greatly by this Malayali race whom he describes as “A Hindu community of the purest and most characteristic type”. He says in the Indian peninsula this (Malabar) will be the best province which will yield highest yielding and interesting information and to do justice to that ,the store should be accumulated by a native of the soil itself. He notices that the existing temples of Malayali dates back to 8th century or beyond and the earliest Muhammadan tombstone at Panthlayini Kollam is of 14th century. More interesting is that he records having seen Nair women perched on wheels in their paddy fields and vigorously removing water collected in the fields .

The best available earliest records of the British India on Malabar is that of Logan and we need not go to any other sources .The eyes of this foreign-born collector who was particular about recording everything that he thought important has done it for us..This chapter is the material of Logan from his two volumes .(apart from a few comments I make to explain certain aspects)

The name of the place is Malayam (hill country)and the people who rule this area is called the Malayali(Tamil =Malai aluvar or kings of hills).Mala is Dravidian and Ali also is Dravidian.This when made into Malavaaram(the sides of the hill) and converted by a change in V to B as the Muslims pronounce became

Malabaara and Malabar. From time of Cosmos Indicopleutus(AD 522-547) upto 11th to 12th century was called simple Male by the navigators of Arab origin and seafaring people, who took spices and pepper .The different pronunciations they used included Malibar,Manibar,Mulibar,Munibar,Melibar(Marco polo) Minibar, Milibar,Minubar,Melibaria,Malabria etc showing how a name can be changed by different pronunciations and languages. The correct term is Malayam or Malavara in the local language Malayalam and Tamil (The Malaya mountains also having the same name) meaning the hilly sides ruled by kings of hills and forests (Girivarga, Vanavasi kings or Kadavaa).The name is a geographic feature of the region which is also called Keralam by the natives. The term bar means a coast in Renaudts translation of The ancient accounts of China and India by two Mohammedan travelers in the 9th century AD.

The boundaries of Malabar in Logans time is as follows:

1.Malabar proper.150 miles between northern latitude 10 .15’and 12.18’and Eastern longitude 75.14’-76.56’

Boundaries .

1,North South Canara districts,East Coorg,Mysore, Nilgris,Coimbatore,South Native state of Cochin,west Arabian sea.

2.19 isolated territories scattered,15 of them in Native state of Cochin and four in Travancore .

3.two detached bits land in Travancore Thangasseri and Anjengo

4.Four inhabited and 10 uninhabited islands of Laccadives ,Agatti, Kavaratti,Androth Kalpeni being inhabited.

5.Isolated Minicoy island (Menakayath was old name)and attached to it a small island Viringilli used for quarantine purposes by the islanders.

Thus 4 degree latitude and longitude was covered by Malabar, 6002 sq mile area roughly without adding the outlying islands. The Wynad Taluk lies above ghats and is a portion of the Mysore plateau. On the southern slope of Nilgiri range lie two forest clad valleys –the silent valley and the Attapady valley which belongs to Malabar. One of the most striking features of the country is the Palaghat pass. A complete opening 20 miles across the great backbone of the peninsula. How the break occurred is not known. It seems like a natural agency broke it and the mountain look thrown back and heaped up ,as if some overwhelming deluge had burst through sweeping them to left and right. (This description seems very important to me since it denotes the deluge of the Matsyavathara when the Dravida king SatyavrathaManu lived)Through the gap the southwest winds bring pleasant moist air and showers to thirsty plains of Coimbatore. Through this the Carnatic (again see the usage. The Tamil country beyond Palghat pass is called Carnatic in Logan’s times). is linked to Kerala. Through this the produce of the eastern and western provinces are exchanged. This is of great economic value to the region. Gentler slopes, rolling down and gradually widening valleys closely cultivated and nearer the seaboard the low laterite tablelands end abruptly in cliffs and give place to rice-plains and coconut-fringed backwaters. The backwaters, the streams, and the numerous canals that connect them afford cheap means of communication for the local people and used for trade and commerce and for irrigation. Coastline show evidence of steady but slow encroachment of sea upon land .The prevailing littoral current is from North to south. It is a branch of ocean current which sweeps from Madagascar and East African coast and impinges on Malabar coast at a point little north to the Northernmost point of the North Malabar where it branches into two ,the main branch go down the coast and the minor go north. Sand thus travels from north to south and hollow out bays .Seaboard is open except to the North at the island Hill of Mount Deli (855ft high) a well-known landmark to mariners. From that to

Calicut are low cliffs and long reaches of sands. Beyond Calicut to the south, the shore is a single long unbroken stretch of sand. The experienced native mariners can tell the distance from land at any point of the coast by the number of fathoms they find as sounding with the lead. Laccadive and Minicoy are coral sand islands and limestone formed from it. Their highest point is not above 30 ft above sea level. The islands are crescent moon shaped with ample lagoon enclosed by coral reefs. Lagoons with intense bright colors of cobalt, green, yellow and crimson, by living corals and fish that dart is radiantly beautiful. The islands have dense vegetation, coconut trees and breadfruit and lime trees in cultivated parts but elsewhere it is only jungle and shrubs and few screw pines.

Mountains:

The western ghats or Sahyan 3000-5000 ft above sea level on Coorg and Wynad, with one or two peaks above 6000-8000 ft. On the Nilgiri –Kunda face, is over 6000 ft. On South Nilgiri falls to 4000ft and Vadamalai (north) and Thenmalai (south) on either side of Palghat gap. Anamalai on south is 4000-5000 ft.

The peaks of western ghat:

Veidal (Vethaala) Mala (in the name of a mighty robber Veda kumar or prince of the Vedda) with a foundation of his old house, and a history that people by treachery killed him and his descendents except a woman whose descendents are still traced. (In Logans time). In April, May and October thunderstorms of terrific violence happen there. (in relation to the two monsoons)

Brahmagiri in which Coorg lies.

Banasur/Balasar peak, Naduvaram peak, with a trigonometric survey station, Tanotemala overhanging Thamarasery, Elambileri peak, (best coffee producing part of Wynad), vellera mala (coffee

producing), Vavulmala (camel hill) due to resemblance to camel hump.

Nilgiri peak, Mukurti peak, Anginda peak, Karimala, (highest peak in north of Palghat), kalladikod peak, (the stormiest peak in Malabar with proverb that if kalladikodan goes black with anger, will not the Karuga river be swollen?

Elimala/Deli mountain. The landmark for mariners for earliest times. VascodaGama 's pilots said the natives call it a mountain of the rat (Eli/Mooshaka). It is pronounced with a cerebropalatal and becomes Ezhimala the land of the sapthasaila or seven hills, (The same as Sapthasaila of Andhraka people. This is an important point I want to stress for historical reasons.) and has 7 peaks and in Marco Polo's accounts it is Eli. Ibn Batuta calls it Hili and as the Eli Kovilakam, the second oldest of the palaces of the ancient line of Kolathiri princes. (This is important, since the first line of the Eli, or Mooshakavansa were the line living in Perumpadappa and Punnayurkulam and the 5 branches of the Thalappally kovilakam or Thalapalli Mooshaka vansa, and its branch Eliankattil kovilakam at that time)

Chekkunnu, Urolmala, Pandalur, Pranakod, Anangamala, and kannanore, Darmapattanam, mananthody, purakkad, pukkunnu, kurnad, kurachimala, and Palghat fort where elevated survey stations exist.

In Logans time Ponnani water communication had become defective and a factory was not built there. The Chettvai was contended for by the foreigners. Thangassery and Anjengo were also used by them. Why Ponnani lost its importance after being contested and won over by the Zamorins from the Kolathiri with help of Kunjali Markkar and his father? That is a question we will leave behind for now.

The other rivers were Nileswaram, which flows through Canara and Kerla, Elimala river, the brackish creeks of it being abode of crocodiles (The vehicle of the varuna and of Vettaikorumakan, paradevatha of Eliyankad and Kerala kings). A two mile long canal built by Aliraja (in 1766) husband of Bibi of Kannanore, while managing Kolathiri domains for Hyder Ali. It links Eli river to backwaters at mouth of Valarpattanam, Taliparamba rivers and give uninterrupted water transport in all seasons. Taliparamba river, bending to north and passing under the guns of a ruined fort of Kolathiri suddenly turn to old bazaar (Payanghadi) and join Valarpattanam puzha and large fertile garden is formed by the banks of it. The valarpattanam puzha has its banks the old Surrukunadapuram (Sreekandapuram) built by Valabha and Sreekanda two brothers of the Mooshaka dynasty, where an old Muslim mosque exist and its emporium of trade was from coorg and sandal forests of Nilgiri and mysore. To this place

Ibn batuta traveled from mount Eli in one day by water. Muhammedan settlement is at Eroocur and trade route to Mysore and coorg is through this village. Up stream at Iritty, the trade route via Perambadi ghat is a massive bridge. At mouth of Valarpattanam (Vallabha pattanam) at its mouth is a well-preserved fort on a cliff and further west in an island in the brackwater is a fort called Madakkara. The valarpattanam belonged to Kolathiri and Madayikara to the British. (These are ancient sites built by Vallabha and his brother Sreekanda mentioned in Mooshakavansa kavya. Valabha's name is also seen in Mahavansa of Ceylon) Anjarakandi river and the island Dharmapattanam is connected to Venkat by boat and the company had a pepper trade outpost there. Tellichery river and Kodoli river, Mahe river, Kotta river, (the haunt of pirates called kottkaal Kunjali Marakkar according to Logan) Vadakara canal partly natural and partly manmade, Payoli canal and Agalapuzha, are mentioned. Agalapuzha water level does not rise much in floods but that of Kotta rise so high to threaten the beach and this difference in level necessitates a water-lock at the

entrance of payola canal from kotta river. Elathur river is connected to Kallai river, and backwaters and to Beypore river by the Connolly canal. (Completed in 1848 by Conolly, collector of Malabar) At low tide water is only a few inches. This was built under special scheme of Mr. Greame (suggested in 1822) for inland water transport from Travancore upto the north .

Beypore river is the only river in North Malabar which brings considerable water from the crest of ghat mountains. One branch arise from Kunda mountain in Nilgiri plateau ,and another from south-east wynad. The branch is gold river. And flows south of Karkur pass, the other the Chaliyar or Chola river, from crest of wynad hills close to a footpath known as Choladi pass ,meet in midst of Nilambur teak plantations, and reach Beypore to the Arabian sea. Even in dry season boats can ascend the stream as far as Mambat under the shadow of the camel hump (vavuli mala) range. Here and in Arikot are Mohammedan settlers. This and all streams of Malabar were known to be auriferous from earliest times and in each annual flood the local people try to get gold from its sands. Kadalundi river from western slopes of Nilgiri and silent valley range and in high tides boats can go upto Malappuram and even further but in dry season this is not possible. Upto 1857 collectors tried to make canals to connect it with backwaters and creeks of Ponnani river

.
What was the reason for succeeding in this attempt?

Logon writes:-

A short length below the surface a bed of clay or mud was found which oozed and filled canal completely to prevent passage of boats. It was of the same nature as found forced upwards from the bottom of the sea ,by submarine volcanic action, or by subterranean pressure of water from the large inland backwaters

,forms mud banks or mud bays in which at one or two places on the coast ,(notably at Narakkal and Alleppey)ships can ride in safety and load and discharge cargo throughout the monsoon season. The same difficulty was noticed in Calicut in making a short canal from kallayi river to the main bazaar.(This is important because it shows from Calicut to Ponnani is new land reclaimed form sea, probably by a natural phenomena and from Ponnani /Malappuram /Calicut the area was once occupied by sea and it is a relatively new addition to the geography of old Malabar .(The fact that cheru and chali are two terms for mud and these are seen in many place names of the area and also in Cheranaad/cherikkal is to be noted)

Ponnani river is the longest river of the Malabar proper. The main stream from the arid plains of Coimbatore (the place where the Cheras themselves ruled)and there are sand shoals which cause floods during monsoons. The riverside portion of Ponnani town is always under threat of sea erosion. The town is preserved and protected by Groynes for the maintenance of which a special voluntary cess is paid by the mercantile community. It has a navigable creek to Tirur.And to south, connected to backwaters of Velliyankode and further south boat traffic is possible upto Trivandrum.(200 miles)The most urgent need is to widen the cut about 2 miles in length ,connecting the Ponnani river with Velliyankode backwater. The cut at present is only 15 ft wide and the water is only a few inches deep in low tide. The veliyamkode backwaters opens to the sea and its opening is maintained by the force with which the tide ebbs and flows. the Chowghat backwater and creek is about 15 miles. Two ridges running parallel to coastline seem to shut off drainage from both west and the east. This hollow is filled with freshwater in the rains and two rude embankments of wattle and mud are made at the end of the rains to keep in the fresh and to prevent the salt water influx which would destroy the heavy rice-crops raised within the enclosure. The passage of boats is maintained by sliding them with extra help

over the obstacles on the unctuous muds of which the embankments are formed. At the southern end the backwaters join the Chetwai river of 6 miles entirely within British territory. Two miles of it lie in native Cochin state territory. At the end of the 8 mile long Chetuvai is a lake that is partly natural and partly artificial. It is the Trichur Enamaakakl lake. Of 25 sq miles and is a singular effort of human industry against the forces of nature which the cultivation of its beds demands. From the subsidence of the floods of one year to the commencement of the following rains, the space of time is barely sufficient for the garnering of a crop. At the close of the rains the water in the lake ,which is protected from tidal influences by a masonry dam at Enamakkal, is drained of by ceaseless labor day and night with Persian wheels aided not infrequently now-a-days by patent pumps driven by portable steam engines ,whose fires glow weirdly across the waste of waters on dark nights while the incessant throb and rattle of the engines and machinery strive hard to dispel any illusions. Every foot of ground that can be thus reclaimed is protected by fences of wattle and mud and is planted up with well grown rice seedlings. Spaces are left between the fields ,and into these channels the water drawn from the fields is poured ,so that boats can be employed for visiting the different fields ,the dry beds of which lie some 3 or 4 ft below the level of the water in the canals. In dry weather the lake presents a magnificent level green expanse of the most luxurious growing rice ,the pleasant effect to the eye is heightened by contrast with the snowy plumage of innumerable cranes and other aquatic birds which here revel in a continual feast.

With the early thunder harbingers of the south west monsoon in April re-commences the struggle with the slowly but steadily rising floods. Numberless Persian wheels bristle in their bamboo frameworks for the contests with the threatening floods ,and as the season advances thousands of the population, many of them good caste Nayar women ,are perched high above the scene on those

machines continuing the day and night struggle with the rising floods for the preservation of their ripening crops. The bulwarks of the fields are frequently breached and the unmatured crop drowned. Often a large area has to be reaped by simply heading the stalks from boats. But as a rule, an enormously rich crop rewards this remarkable industry. A small portion only of this lake lies in British territory. The major portion belongs to the Cochin state ,and as already observed ,a masonry dam at Enamakkel is necessary to maintain the level of freshwater in the lake and to keep out saltwater. The original dam seems to be formed sometimes during the 18th century by the united efforts of the zamorin and the Cochin Rajas. They erected an embankment of hewn stone above 200 ft long across the backwater of Enamakkel. In 1802 Asst collector Mr. Drummond ,under the erroneous expectation of benefiting the neighboring lands ,caused the dam to be partially destroyed. (This year in 2009 ,the authorities destroyed the bund of Viyyam kaayal for fear of a popular uprising ,the people taking upper hand in administration to cause destruction of next years prospect of raising a good crop of paddy which is saddening to note)But the consequence was that a large area of land fell out of cultivation owing to the influx of salt water. Various attempts were made especially in 1823 and 1842 to construct the dam on its original plan. Project for a new dam lower down the dam at Chetwai was proposed and between 1855 and 1858 preparation for constructing this work were undertaken. The idea was abandoned ,however, after Rs 35000 had been spent on it and since then the original dam has been annually patched up at the joint cost of British and Cochin Governances. Three major branches of Kaveri (kabbani,Rampur,and Bavani river)originate in Malabar. The first two are in Wynad and Bhavani rise from Kunda mountains flow through Attapadi valley where it is joined by several branches largest called Siruvani or small Bhavani .It rise on the forest clad mountains of northern edge of Palghat gap Acquiring a considerable volume in a short amphitheatre of mountains on the vast crest of the ghats it pours itself in a

magnificent cataract ,said to be 2000 ft high ,over a precipitous ledge of rock which hems in the Attapadi valley on the south. At the top of the ledge of rock is a deep pool in the bed of the stream called Muthukkulam which is regarded with superstitious awe with local people and about which many wonderful stories are told. It is said to be fathomless and people declare that extraordinary and tremendous noises do at times issue from it ,and roll cracking among the rocks.

About the geology ,Logon says the midrib of south India ,which stretch from low-lying gap in Palghat ,below the Nilgiris ,to within 15 miles of cape Comorin.The mountain land does not run down the middle of peninsula but keeps to the westward. So that there is a broad stretch of low country on the Madura and Tinnevely side ,while that of Travancore is narrow. Then the mountains suddenly drop to the east, and send long spurs down to western coast .In Madura and Tinneveli a southerly prolongation of the wide plain of Carnatic that stretch round by cape Comorin and join the narrower ,though rather elevated ,low country of Travancore ,Cochin and Malabar. The narrower ,higher land of west coast presents traces of a plateau or terraced character (seen best in Malappuram in Ernad Taluk,and in Chirakkal Taluk north and south of Taliparamba river reaching from Mount Deli upto Elathur river mouth.Mr King observed the plateaus of Beypore and Calicut and it is due to denudation of an original planed down terrace of gneiss into detached plateaus ,the upper surfaces of which are altered and laterized to a certain depth. FN pp 19 vol 1)which is displayed at Trivandrum and northwards to Cochin into Malabar country. South of Triivandrum these marks gradually disappear the last trace being at plateau bordering the seashore at Kolachal.This even surfaced tract of the country is 150-200 ft above sea level and it touches the shores in cliffs or headlands at two or three points ,at warkilli,Paupancheri hill southwest of Thiruvananthapuram.

To an observer traveling to Trivandrum across Ariamkott pass from Tinnevely, the change from parallel ridges and broken form of the lower hilly country to comparatively smooth downs of Trivandrum is striking. Northwards from Trivandrum are the absolutely lowland on the sea level. (from Quilon to Alleppy, backwaters of Cochin, Trichur Enamakkal lake, backwaters connected to Veliyamkott, between Kotta and Elathur rivers, Agalappuzha, backwaters of Thaliparamba and Valarpattanam puzha.)

The rock formations are gneiss series. (one of the oldest known formations of terra firma. The surface of Wynad in 1882 showed that it was formed and exposed, after 2000 ft of gneiss was slowly worn away between the Nilgiris and the Vellaramala for a very long period of time.) Quilon beds are of Eocene age. Warkkili beds of upper tertiary age. equivalent to Cuddalore sandstones of Coromandel. Warkkili beds are seen in Beypore and Cannanore (a quarter mile from the sea). Travancore is rich in garnetiferous gneiss. red, blue and yellow sapphire and jacinth are seen in garnet sands and is common in seashore. Titaniferous iron is seen in sea sand. bright scarlet, black, purple, yellow and white sands of all these minerals and ordinary silica is seen in Cape Comorin.

Nilgiris has massive grey gneiss with crystallized quartz rock very like reefs of vein quartz. The beds are felspathic, feldspar occurring in quartz giving a granite appearance. In Nellur ore similar rocks are found. But it is fine compact quartzite while in Trivandrum it is not in compact form. Felspathic quartzose gneiss is charged with garnets. Iron is less in the gneiss but abundant iron is seen in weathered gneiss and other formations. The abundant ferruginous matter must come from the weathering of garnets.

The gneiss lie in 2 to 3 parallel folds of west-north-west and east-south-east. More towards the north in Cochin territory and Peermad. Between Trivandrum and Tinnevely (12-20 miles

inland)the dip is high to south-south-west terraced plateau and or among the parallel dips the first north-north-east dip. Then again a high south-south-west .They are at synclinal angle at east and anticlinal at west angles. At kurtallum on Tinnevalley side the rise from synclinal well displayed and in their strike west-north west ward into broad mountain land ,beds of which take part in great anticlinal displayed at great flat arch of Peermad strata. This is the south part of Ariankow. Nature of gneiss of Trivandrum, Cochin and Malabar to easily decompose to white ,yellow or reddish felspathic clayey rock which become laterites.

Laterite contain ferruginous debris. May be marine,fluviatile or sub aerial action and alteration on gneiss .In Malabar and Simhala it is called Kabuk or kaaavu .The warkkili bed and rock formation is rich in ferruginous laterite of three types

- 1.superficial ferruginously cemented debris
- 2.ferruginous clayey reddish brown colored irregularly vesicular and vermiform scabrous rockforming uppermost part of werkkili beds
- 3.altered decomposed gneiss called Kabuk,or lateritized gneiss. This shows original xalline structure and constitution.

400 ft above sea level the alteration starts. Lower down at 150-200 ft above sea, a better defined belt of weathered laterised gneiss with frequent unaltered rocks. This is a country of undulating downs with uniform stretches of forest lands (without thick and lofty jungle).Occasionally with plateau surface and low flat topped hills. Indented with deep river valleys and streams and even with backwaters having high and steep shores.

Malabar show the plateau character of lateritic gneiss. It is made of weathered decomposed gneiss .The sand is red peroxide of iron

changing to brown peroxide. The warkkili beds have argillaceous limestones ,a kind of dolomite ,in which a marine fauna of univalve shells(*Orbolite malabarica*) having an ecocene facies was found 40 ft below the laterite to Quilon which is really the upper part of the next group.

Logon says in Malabar on the western side ,is an old marine terrace ,which must be of later date than the warkkili beds.(upper tertiary stage as cuddalore sandstone but sandstone patches are very little and that too towards the southern tip nearer to Kanyakumari)He calls it late tertiary or post-pleiocene and he thinks at some time in the past the Indian land raised straight from sea by Western ghats and he thinks of the story of reclamation of the land of Kerala by Parasurama.A terraced form of marine denudation of the mountain in very gradual steps with weathering is a possibility.

Recent deposits are only at the coast and alluvial beds of rivers in coastal area.

Natives classification of geological types of soil:-

Pasima:-rich heavy,clayey tenacious soil

Pasimarasi:-the above mixed with sand, and of loamy character

Rasi:-sandy soil.

Each subdivided into 3 so that there are 9 types of soil. This is used for revenue assessment of rice-lands by natives .The Hindu sastrha says:-one cubic kol or yard of earth being excavated, soil of the best description (pasima)if put back into the pit thus excavated ,will suffice more than to fill it. Loamy(pasimarasi)will exactly fill it. sandy(rasi)will not suffice to fill it.

Rasi soil in coast for coconut farms. subsoil water easy for its roots to reach Uplands with detrital laterite are gravel quarries and are laterite gneiss. The most productive grain land is in Wallavanad Taluk where laterite is scarce and where pasima lands are met with. On mountain slopes where gneiss does not crop up, an immense store of rich black mould by decayed vegetable matter.

Climate and natural phenomena in Malabar described by Logan.

Uniform annual mean temperature on sea-coast 81 degree Fahr. Never rise above 90 and falls below 70. This is not due to great altitude of sun though the altitude of sun is always great here, and its hours of shining comparatively long throughout the year, maximum of 12 hours 35 mts in latter half of June to minimum of 11 hrs 35 mts in latter half of December. The reason for heat is the superheated surface soil. The surface radiates the heat both at day and night and maintains the comparatively high temperature. Another reason is the water vapour. The Madagascar water current that impinges at little north of Malabar brings with its atmosphere saturated with moisture. Seabreeze saturated with water vapour blow steadily for several hours in dry weather. During June, July, August, the SW Monsoon winds blow night and day off the ocean and rolls up before it dense masses of vapour. The superheated sand radiates heat and that instead of radiating to space absorbed by aqueous vapour and acts like a blanket, preventing earth from losing heat, at night and greater the heat, greater the capacity of atmosphere to absorb moisture. A cloudless night in Malabar does not betoken a cool night.

These have its advantages. The ocean never become overheated like the land and ocean breezes blow throughout year, in particular the south west monsoon wind, are cool winds. The temperature of atmosphere is low in that time, though the sun at that time

attains its greatest elevation in heavens and for months the clouds shelters earth from sun's direct rays.

The dense unbroken clouds in monsoon by condensed water vapour and rains maintains the uniformity of temperature. To convert water into steam requires large amount of heat, and the reverse process, condensation of water vapour to rain, necessitates large liberation of a large store of heat. So on as water is in gas form heat is insensible and on being liberated it helps to keep up temperature of air. Evaporation from ocean and rivers play part in reducing temperature on land. Vegetation thrive on such a climate, and there is luxuriant grass, shrubs, tree in Malabar. The mountains cools down the winds and in Palghat gap hot winds pass through it and cause a check in vegetation in dry months. Even there the balance is maintained with longer sea breezes that keep fresh nights, cool mornings even in March, April the hottest months of the year. The tropical nature with lot of moisture in air is congenial to health of man and animals as it is favorable to vegetation. All articles are weathered and powdered and lost due to moist weather. (mildew, rust, etc). There is extreme regularity to the seasons. On 22nd of March at 2 PM the first shower falls. This was known to the locals and Logan saw that it was right and he knew that it was not a guess. He says that day being vernal equinox and 2 PM is the hour at which the battle of sea breeze and land wind begins. The first distant rumble of thunder along ghats is heard at that time. Nature's pendulum commences to swing back as sun cross equator into northern hemisphere. Throughout seasons with a regularity to months and almost to days and hours, perfectly astonishing to people (Europeans) accustomed to live in less settled climates.

The rotation of seasons:-To end of March and beginning of April first distant mutterings of thunder heard among hills. End of May to beginning of June SW monsoons obtains mastery, regular rains begin with electric storms of violence. The roar of thunder is

continuous and for minutes together and blaze of many-colored lightening incessant. In 1873 one of such thunder peals lasted for 35 minutes. Once thunderstorms cease the winds settle, steadily in west, as season progress, it veers a point northward to west. It blows steadily from southwest. The reason for movement to north is the ocean current which at this season is from north to south. At end of September SW monsoon dies away ,natures pendulum swings back, and royal battle between aerial currents again starts. In October NE monsoon become strong(land wind)and with it rain become less frequent and the country begins to dry up, and by end of December the dry weather has set in. With vernal equinox the period of disturbance of sea wind and land wind again sets in. M'Crindle's translation of *Periplus Maris Erythraei* about the SW monsoon and its importance to navigators:-:The whole round of travel from Kane to Endaimon Arabia used to be performed in small vessels which kept close to shore and followed its windings but Hippalos was the pilot who first ,by observing the bearings of the port and configuration of the sea ,discovered the direct course across the ocean. Whence as ,it seems ,our own Etesians are blowing ,a periodical wind from ocean likewise blows in the Indian sea, this wind which is the southwest, is it seems, called in these seas Hippalos (after the first pilot who first discovered the passage by means of it).From the time of this discovery, to the present day, the merchants who sail for India either from Kane or as others do from Aromata,if Limurike be their destination, must often change their track, but if they are bound for Borugaza or Skythia they are not retarded for more than three days., after which committing themselves to the monsoon which blows right in the direction of their course ,they stand far out to the sea, leaving all the gulfs we have mentioned in the distance.” It is generally accepted that Hippalos was discovered only

in 1st century AD.(See that Hippalos is Greek for horse, or the name for Aswins and this was discovered by Indians from Vedic

times and mentioned in all scriptures and Greeks knew about it only in 1st century AD). Even after Hippalos in first century AD Gama took 14 centuries to know root of monsoon winds which itself is proof for the fact that the European sailors of Greece ,Rome etc did not master or know monsoon wind paths at all. The knowledge was heard knowledge not experienced or mastered one. Because monsoon is not a feature of Greece or Rome but of Monsoon India .There is no other reason for this.)

Rain and storms:-Rain and floods are frequent. On 19th and 20th of May 1882 a heavy rain registered.18-25 inches in 24 hours in Calicut.In 1871 6 inches per day for 6 consecutive days. But floods do little damage.(Please do note this point .Because now floods cause damage .The reasons we have to discuss in another chapter.).The rivers have in the course of ages worn down for themselves deep rain beds ,which contain all ordinary floods and the common laterite soil of the country is so porous that within half an hour of the heaviest shower the roads are dried up but for the dripping trees and bushes there will be little sign to tell that a heavy rain had just ceased. Of unusual storms there are but few records. The western ghats prevent or disperse any cyclonic tendency of winds but the squalls during southwest monsoon are terrific in violence and do damage to ships .The squalls are accompanied by mountainous waves and winds with these waves smash the strongest cables of the best equipped ships. With anchors gone ,the ships try to set sail, but after the squalls the wind has a lull, while the sea run as high as ever. The ship drift slowly into breakers and the most skillful seamen attempt to beach the ship instead of trying them to take out to sea.

Great storm on 16,17,18th of April 1847 originated in Laccadive islands and damaged Kavarathi,swept over kalpeni and Androth and Agati was beyond the circle of its violence. Of 90000 coconut trees in kalpeni and Androth ,the hurricane left only 700 in

Kalpeni and 8000 in Androth. Kalpeni was partially submerged and drinking water in wells spoilt, and stores of food and houses destroyed. Of 1600 people in Kalpeni, 450 survived but only 300-400 were perished after the storm in a famine, and others had escaped and left the island or lost in storm. 96 males and a few females from Agatti tried to escape in two boats and perished in storm. The effects of the storm was felt from Cannanore to Chetwai.

1. Destroyed Caannanore custom house.

2. Rushed up the kotta river destroyed palliyad dam and cultivation above it over 2 miles from mouth of the river

3. Breached the new work on Connolly canal at Calicut

4. At Parapanangadi and Thanur private persons suffered from the rise of the sea

5. The wave rushed up the Velliyanakod kaayal and destroyed Ayinichira dam and cultivation above it.

6. The sea forced a new and deep opening into Chowghat back-water and broke with much strength in the Ennamackal dam (8 miles from river mouth) which however sustained no injury. But the crops in the bed of the lake were injured by the floods from inland. Earthquakes are not very frequent and when they occur are not very destructive.

31 st December 1881 7.10 AM. from east to west a tremulous motion at Calicut for a few Seconds

A similar one in midnight the previous night had a peculiar rumbling noise and of rushing waters but very faint. This was felt

from Malabar coast to African coast and as far north as Kathmandu in Nepal and south at Andamans.

2 months later 28th Feb 1882.6.16 AM at Calicut as far north as Tellicherry and east to Nilgiris .A local affair but with a muffled roar approaching,passing and roaring away.Like a short train passing through a tunnel underneath. The direction was from south to north.Furniture, windows and roof tiles shook for a second.

1882 October 14th 2 PM .Alathur Palghat Taluk a noise of underground train from east to west .Tables and boxes rattled and it lasted a second.

The following were reported from Trivandrum:-

Feb 1823

Sep 10 .1841

Nov 20 .1845

March 17.1856

August 11.1856 .Five hrs 51 mts 25 sec AM

August 11.1856.Four hrs 25 mts 10 sec PM

Sept 1.1856.zero hr 15 mts 0 sec PM.

Kedvellam(stinking water):-After rains, sea and backwaters emit a foul smell. Water is dark porter color or with deposits of lack mud on sand. The fish and aquatic life perish and there is putrid odour.The cause of the effluvia in hot season is difficult to determinebut Dr Day quoting Bennett say that it arose from

presence of innumerable *Arum foetidum* as in Ceylon. It was seen in Tellichery where no mud banks exist in 1836. If this is present people vouchsafe in monsoons, calm harbor of refuge for ships. (due to the calm nature) Three places where the mud banks and mud bays are seen are Northern Kollam near Quilandy, Narakkal in Cochin state, and Alleppey in Thiruvananthapuram. Narakkal and Alleppey mud banks allow safe loading of ships in monsoons. In 1498, Vasco da Gama was said to be protected by the northern mudbanks. In 1793 thinking that this is true Joint commissioner of Malabar permitted company ship Morning star to lie there during south west monsoon season. It was wrecked. The mud is churned up from bottom and spreads on surface and making a calm surface. H. Crawford recorded that a subterranean passage of streams communicating with some of the rivers and backwaters become more active during and after rains, and carry off the accumulated water and with it vast quantities of mud. The mud banks act as anchorages to ships. When 700 yards east to Alleppey beach pipes were sunk at depth of 50 ft to 60 ft when the shaft ran down to 80 ft, mud came up just as the same that is seen in the sea and a cone of mud appear above water with bubbles and throws out immense mass of soapy and blue mud in the form of boulders with fresh water, debris of vegetable matter decayed, and in some instances fresh and green. Mr Crawford's successor Mr. Rohde confirmed these observations and notes mud volcanoes bursting up in the sea during rainy season as if a barrel of oil suddenly started below surface. The mud bank thus formed is floated away to south by littoral current, and fresh mud banks made wherever hydraulic pressure of inland backwater increase sufficiently to overcome subterranean resistance offered by stratum of fluid mud which exists at the spot described by Crawford. The mud bank at Alleppey increase and diminish as level of inland water rise and fall, and this was most observable in rainy season of 1882. (same year as multiple earthquakes were recorded).

The unctuous, sticky, soft foetid green mud under microscope had minute fragments of quartz, foraminiferous shells (genus rotalia), and a few fragments of larger shells, diatomacoea (species upward of 20 genera), a few spicules of sponges and corals, very minute, and some amorphous matter which was not destroyed even after boiling in strong acids. It was tenacious and sticky resistant to pressure like a stiff piece of jelly. Acting like an immense spring, it yields to pressure of waves, the water thus loses its force and becomes quiescent. The mud expanding is preparation for a fresh encounter. 62 species of 30 genera of cryptogamia and subgroups diatomiae were recognized in it. The ked vellam (stinking water) and mudbays/mudbanks need not be connected. Fish can live in mud banks but not in ked vellam. Ked vellam gets its deadly character to generation from subjacent strata by volcanic heat of poisonous matter or vapour, which is absorbed by water. The mud banks also derive their mud oil from similar volcanic sources and are also replenished by subterranean passages, full of liquid mud, communicating with sea, on one side and backwaters on the other.

The oil in the Warkilli strata is due to distillation of oil from the ligniferous deposits, which may be due to moderate heat from a line of volcanic energy lying parallel to west coast of India.

Fauna and flora :-

Rhodes Morgan (British Ornithologists union) classified it as

1. Littoral zone. sea level to 200 ft. Rainfall 70-133 inches
2. Zone of deciduous forests five miles from base of western ghats in SE portion of range extending up to elevation of 1500 ft. rainfall 130 inches.
3. Tropical evergreen forest from 500-3500 ft. Rainfall 130-180 inches

4.Evergreen shoal forest from 3500-6000 ft.Rainfall 180-250 inches

5.Scrub shoal forest from 6000 ft upwards. Rainfall 250-300 inches

6.Open grass ,scrub,bamboo,mixed deciduous and evergreen forest(Wynad plateau)from 2000-2500 ft.Rainfall 60-90 inches.

7.Heavy deciduous forests. With teak zone .50 – 80 inches rain.

Logan traveled from Calicut to Mysore frontier and noted each of the fauna and flora .He started from Elathur beach at foot of ghats near Kuttiadi and noted the following:-

Cocos nucifera

Corypha umbraculifera(giant talipot)

Borassus flabelliformes(palmyra)

Caryota urens(sago palms)

These are near the houses.

Areca catechu(arecanuts) at edges of paddy fields

Mangifera indica(mango tree)

Artocarpus(jackfruit)*vateria indica*(white dammer)

Poongamia glabra(poonga/ungu)

Ficus indica and *religiosa*(banyan and peepal)

Poinciana with gaudy blossoms in house compounds

Lagerstromia reginae(house compounds/in full bloom at base of ghats)

Cassia fistula(graceful Indian laburnum)

On low laterite hills Anacardium occidentale(cashewnuts)

Casuarinas equisetifolia on hills and there it support shrub by growth of lantana,eugenias,(Eugenia bractea in Wynad of 30-40 ft height and 2 ft diameter is a small tree whereas here it is a shrub)two species of Euphorbia(E nivulia, with 20 ft height) santalum album(sandalwood)occasionally sown by birds from cultivated trees in the neighbourhood.

Elathur:-

The boat was cut with a single log of Iynee(Artocarpus hirsuita) and a neat semicircular awning of corypha leaves.Pole is of bamboo.

Banks of Agalapuzha with everlasting coconut fringes. Jacks, mangoes,talipot and sago palms occasional silk-cotton(Bombax malabaricum)in each house, groves of trees sacred to snakes (with images of cobra smeared with castor-oil, red ocher).

The Frangipani(Plumeiria acuminate),hornbills(Hydroscissa coronata) eating golden fruits of Nux-vomica(strychnos nux-vomica).

Thousands of little red crabs on banks.Cerebera odollum looking like mangoes but poisonous. In marshes dense growth of Dillivaria(D,illicifolia)which is retreat for muggers(Crocodilus palustris)lazily enjoying hot sunshine

Otter families (*Lutra nair*) diving and chasing in play

Kingfishers of four species .Large stork-billed kingfisher (*P. gaurii*), kingfisher (*Ceryle rudis*), the brilliant *H. smyrnensis*, and her smaller cousin *Alcedo bengalensis*.

Bee-eaters *Merops swinhoii* and *viridis*

Snowy egrets (*Bubulcus coromandus*)

Various types of fishes and insects which are their prey

Fish like Bombay ducks with long serrated beaks like bill of a snipe and an ancient fish-like odour.

Payoli loak-A small fee for the tollkeeper. Through a canal reach from Agalapuzha to Kuttiadi river.

Lates calcarifer (Nair fish)

Then the ghats rise with forest from head to foot. Boatman paid his fee, and on horseback proceed. Thousand plumigated birds fly from branch to branch and chatter. Ubiquitous coconut palms on either side. But many forest trees grow in between and luxuriant pepper vines on each tree.

Lovely *Erythrina indica* with scarlet flowers specially for this purpose.

Logan see two elephants with abscess in jaws due to carrying logs .

In kuttiadi forest they see logs of ebony (*Diaspyros ebenos*)
Irool (*Xylia dolabriformes*) Mutti (*Terminalia tomentosa*) Poomaraudu (*Terminalia paniculata*) red

cedar(*Acrocarpus fraxinifolius*) and white cedar(*Cedrela toona*). A few yards from the depot is a punam clearing with tender green of the blades of sprouting grain. The owners are the Malayar examining his dead falls (the rabbits, porcupines, small deer, and mouse-deer called *Memimna indica*) for which he has kept traps. Then a dense forest with stems of *Cycas circinalis* which give nuts. The fruits are as large as the pigeons eggs, some green and some golden yellow. The forest has grown denser.

The *Schleicheras* (*S. trijuga*) are the most magnificent trees Logan has seen. With bunches of fruits the size of a robins eggs and seed containing oil and even the branches give oil. This tree resembles an oak. And near palghat the country is covered with them.

Lofty specimens of *Hymenodictyon excelsum* with barks which is bitter. *Bignonia* and *Alstonia* (*A. scholaris*) belonging to order sapotaceae. Other genera of this useful order

Bassia longifolia common in Palghat is not seen here.

Isonandra wightiana is a little higher up in forest. Below a wooden bridge spanning a mountain torrent over a bed of gneiss is a pool of water with sapphire blue color and *Barilius bakeri* (fish) dart at small flies. A noisy group of *Macacus radiatus* eats yellow berries growing on a creeper –enveloped tree that overshadow the pool.

As the ghat is ascended an undergrowth of *strobilanthus* in flower. Bamboo *arundinacea* has seeded and jungle fowls (*Gallus sonneratii*) are rejoicing. cocks and hens and a black langur (*Presbytis jubatus*) with family. As the stream is crossed the gigantic size of trees surprise Logan. A black dammer (*Canarium strictum*) with a mass of resin from a cut in its bark, *Isonandra wightiana*, which Logan strike with a shikar knife to see its milk

oozing out and flowing down. This hardens into a gutta-percha which is useful. A little tree *Baccaurea sapida* trunk covered with racemes of pinkish red flowers .It has little angular red fruits .In October when cardamoms ripen ,the size of this fruit will be big ,the size of a duck and aril inside is sweet sub-acid and pleasant and refreshing tasting like a mangosteen .Cardomoms(*Elletaria cardomomum*),and a *Laportea crenulata* (devils nettle) overhead with poisonous hairs on leaves ,*Mucuna pruriens*(cowhage)the pods covered with stinging hairs and a purple flower with a terrible smell.

Then a coffee estate.The paradise flycatcher(*Tchitrea paradise*) with its chestnut coloured spouse which cares its children which are migratory birds.The purple sunbird (*Cynniris lotentia*)with quivering wings beating quickly as it drinks nectar from coffee blossoms. Down the rocky stream is the Malabar blue thrush (*Myiophonus horsfeldii*)whistling away. When monsoon come he builds nest in a rocky cleft near a torrent inaccessible to monkeys and snakes.

Squirrel(*Sciurus tristriatus*)a smaller one(*S .sublineatus*)Malabar squirrel(*S.malabaricus*)racing up a giant dammer (*Vateria indica*). On the tree trunk is a neat hole chiseled by *Pteromys petaurista* as a home. He has a parachute wing with which he sets sail gracefully down the valley.

A small species of squirrel(*Sciuropterus fusco capillus*)also live in such holes.Then Logan notices the noble valuable trees and a multitude of them too .A splendid iron wood tree (*Mesua ferrrea*),irruppu(*Cynometra ramiflora*)fine jack(*Artocarpus integrifolia*)60 ft to the first branch and over 3 ft in diameter. He notices that it is not a cultivated tree but a wild tree growth and never touched by man for profit .A splendid poon spar (*Calophyllum augustifolium*)and hundreds of such magnificent trees .He calls them as “*Flora sylvatica* “due to its beauty and

magnificence. Then they come to the clear clean mountain stream. From there they could see the sea, the white sails of fishing craft coming homeward laden with seer-fish and pomfret. From the base of the hills to the sea is coconut palms.

Then they descend. See the *Boehmeria* (*B. malabarica*) that produce splendid fibre. The string of bow of the Kurichiya is made of it. Logan describes the bravery of a kurichia uncle who killed a tiger (which killed his nephew) with an arrow that crossed its heart and bounded across the open country grass hill side to the next shoal. (This is in contrast to the fancy tales of Jim Corbett who pictures the natives as cowards). The team stayed in Korothe Bungalow and started early to the Balasur mountains. (The bungalow is at its base). Crossing coffee and lantana they reach a primeval forest. Ground strewn with large round prickly fruit (*Cylindropuntia excelsa*) like green hedgehogs. The spines are 3 inch long. They fall fast and a tribe of wandoos (*Leontideus*) feed on them. They are the lion-tailed monkeys. *Solanum robustum* has leaves 3 ft long and 2 ft broad which is velvety. They and the stems are armed with spines. The orange fruits are as big as badminton ball and covered with thick coat of spines. When peeled the fruit look like a hardboiled egg. They taste nicer than the Brazil cherry (*Physalis peruviana*). The *Solanum* of Peru is unarmed without spines. It is grown in botanical garden of Ootacamund. The lovely *Thunbergia* has racemes of pendent golden flowers. Another species of it with streaks of orange-maroon also seen. Usually they flower in cold season, but this one has glowered out of season, when Logan saw it.

The gigantic *Ficus parasitica* with a thousand aerial roots descending to ground thickly was seen and it was so thick that it was difficult to pass through them. The anastomoses of main stem and branches had made arches. The smaller roots produce a silky soft fiber, very strong and Kurichia use them for bows and are known as Colinar. They prefer the manali naar (*Boehmeria*) for it.

It was curious that there was little leaf mould on ground .Termites and rare splendid earth-snakes have done it.The elephant beetle which rolls the elephant dung to pits are in plenty also in Mysore forests .Inside the dung we can see a yellow egg as big as the end of our finger which will emerge as larva .It is food for the black sloth bear (*Ursus labiatus*).

On the trunk of a dammer tree Logan see a black line of termites reaching to a nest 100 ft overhead ,60 pounds in weight and as hard as iron. He says 20 species of termites are there and in Burma is a giant termite half an inch in length .*Manis pentadactyla*(ant eater) also was seen. The area is the 3rd zone of tropical evergreen forest. And there on rocky gneiss a thousand rock-plantains(*Musa ornate*)seen and wild plantains (*M. superba*)in clumps in ravines lower down and have golden fruits.*Kurichia* munches them and the common fig(*Ficus glomerata*)that swarm with a multitude of two-tailed flies.*Gamboge tree*(*Garcinia Morella*)wild nutmeg (*Myristica laurifolia*)*Mangustifolia*,and a tree with pale green flowers arising directly from trunk,*polyalthia*(*P.coffeoides*)with strong bark is described. Another of the same order *Anonaceae* with glabrous leaves is *Goniothalamus*(*G. wightii*)which is rare in north but very common in Palghat in Chenat Nair forest.

The dense undergrowth of dwarf screw pine(*Pandanus*)had to be cut to go forward. And then *strobilanthus paniculatus* which has different species and vary with elevation.*Hemileia vastatrix* destroying coffee plantations was seen.*Dichoceros cavalus*(large noisy hornbills)were having their breeding season and Logan describes seeing them. Then Logan is shown a vast area of forest destroyed by Mappillas for coffee plantations. After one hour ascend reach another shoal, entirely different from the one they just crossed. The trees not so lofty, undergrowth denser, species of *strobilanthus* different ,birds abundant and bees and insects keep a

continuous hum in blossoming trees overhead. Then they enter the 4th zone or evergreen forest.

A dense growth of dwarf bamboo (*Beesha Rheedii*) barking deer (*Cervulus aureus*) a bees nest (*Apis mellifica*) lycopodiums and balsams along a brook, on moss-grown rocks. A funny frog (*Hylorana*) squatted amongst them and greets them with his music with a monotonous running up the scale like "Tunc-tuk-tuk-tuk-tuk-tuk" The kurichia comes with a mass of golden honey comb cut from the hole of a *Eugenia* (with divine scent of camellia-like flowers of the oron wood *Mesua ferrea*) because the honey mostly come from that flower. They have breakfast for half an hour and see a fussy spur-foul mother (*Pteroperdx spadiceus*) with her children They see the signs of a sambar (*Rusa aristotelis*) where it has rolled in mud and rubbed the back on rock and sharpened horns against a *Garcinia purpuria*. The Kurichia who is the guide collects the fruits of the tree which is used by people as substitute for tamarind in food. *Eugenia*, *simplochos* and cinnamon are seen with their different species. *Cinn. Zeylonica* is the common variety. *Euria japonica* is like tea shrub and 2 species of *tetranthera* on which Atlas larva feeds, *Biscoffia Javanica* on which *A. luna* silkworm feeds. *Evodia triphylla* with several butterflies (*Ppilio paris*) around, *Hestia jasonia* with lacelike wings. Logan collects three species of beetles, a handsome green elator, large rose beetle, one of the *cetonidae* and a fine specimen of the horned beetle. (*Odontolabis burmeisteri*). The kurichia find a 8 inch long scorpion of dark blue color. He tells them the story of a snake he found here once with brilliant scarlet wattles like that of a cock on his forehead. Logan assumes that it must be the mountain cobra (*Ophiphagos elaps*). The kurichia has once killed an 18 ft long boa with an arrow. The greenish brown viper is common here, Logan says. Logan says he was bitten a 100 times by it!

After ½ hour they reach the dwarf shoal forest or 5th region and undergrowth is denser. They had to cut every yard to make way up.

Great stretches of boulders to be scrambled over and common nettle (*Giardinia peterophylla*) stings. The dwarf eugenias and ilex (*T. weightiana*), scrubby bamboo (*Arundinaceae wightiana*) only 6-8 ft high are common. A harsh strobilanthus species difficult to struggle through is seen. Rare laughing thrush fly from bush to bush (*Trochalopcrum jerdoni*) and the blue rock thrush (*Petrocyncla cyanea*) sits looking at the travelers from boulders above. Other birds in plenty are securing food and Logan see among these multitudes of species *Zosterops palpebrosus*, *Hypsipetus nigeriensis*, *Dendrophila frontalis*, common green megalaima, swiftlets (*Collocalia unicolor*) which roost in caves of Brahmagiris and breed here in seasons. Nilgiri kestrel (*Cercheneis tinunculus*) eats a mouse on a rock and flies away with prey as the travelers approach.

Then they reach peak and look round. Away to east they see great pools of Kabbani, to right are the peaks of western ghats, and beyond the Nilgiri plateau, with black storm clouds gathered and vivid streaks of lightening dart forth like tongues of flame and boom of distant thunder echo from rocky cliffs around. Clouds gather on the left on Brahmagiri, and Dindamal hills so they hurry to get down by another way, the Terioot face of the mountain. Reaching the foot, they mount on horses and go to Koroth bungalow in time for dinner. At midnight the storm bursts and torrential rains come and for an hour thunder and lightening continuously echo the mountains around. At daybreak they start en route to Mananthavady 10 miles away. There are a 1000 birds rejoicing the fresh cool air. The orchid *Dendrobium aurum* fills air with lovely odour. They collect its golden flowers and others from many trees. There is a great bed of red wild ginger. Trees are covered with festoons of Hoya and handsome ferns and fine tree ferns (*Alsophila glabra*) is seen. The forest is deciduous with several evergreen trees like *Vateria indica*, *Evolia triphylla*, the shrubby *Wendlandia notoniana* and Logan collect specimens of Atlas moth larvae (*Attacus atlas*).

The forest in that part is ruined by Koomree(Kumari)cultivation of fields of raggi for years and there is only shrubby vegetation. With trees like Evodias,Lagerstromias,Wodina wodier ,Bignonias, Careya arborea,and heavy growth of bracken. An old avenue with vateria indica ,ficus bengalensis ,Artocarpus integrifolia are seen on either side of road and between patches of jungle were open grassy downs with cattle and buffaloes grazing on them. They have wooden bells and the monotonous rattling is not pleasant but curious for Logan and he is afraid of them .He passes several Mapilla homes on either side with their small coffee gardens and jack trees and on them discoreas are grown for the tuberous roots. At MananthawadyLantana is abundant and gives asylum to panthers(Felix pardus)which prey on village dogs and calves.At 9 they reach the forest office and the experimental garden. In that Ceara rubber(Manihot glazovvii)mahogany(Chloryxylon sweitenia)cocoa(Theobroma cacao)rain tree(Pithecolobium saman)sappan(caesalpinea sappan)are grown.

The next destination was Imperial forest Reserve at Koodrakote. Logan notes that the board is nailed on to a young Nauclea species tree with curious flowers like olive-green badminton plants. A swamp of screw pine (pandanus odorattissimus)and willow(Salix tetrasperma)is noted. He see a solitary tree with nests of cliff bee (Apis dorsata) .Passing Oliot police station and reaching village of Sunnuthgoody he see a road to right ,leading to Mysore.

He find a very valuable forest which belong to 7th zone first class deciduous trees and teak.6th zone was open grass scrub and bamboo with mixed deciduous and evergreen forest.Mutty called kurramarudu (T .tomentosa)in plenty and grand logs of it is noted by him. He says 70-80 ft long straight trees like an arrow, which can fetch good remuneration to the Govt if sold and considers it as a mine of wealth.(It is here that the entire programme of seeing the forest is revealed as a survey for commercial generation of

wealth).His own words:- “But we cant sell it now. ...However when a railway affords cheap carriage and saw mills are at work ,we may hope to make a fair profit out of it yet”.(This mindset is still in our new Governments ,sad to say.)The magnificent logs of *Pterocarpus marsupium* ,the next best timber to teak grew abundantly .Logan observes the mastery of the Bet Kurumers in sawing, squaring and marking the logs professionally. He notices the hieroglyphic like signs and says he has no T-square ,tape,foot-rule,chisel or hammer ,nothing but his axe and yet makes a squared log measuring with his eye and stamps a seal exactly in middle. (His sign shows the number of the log, its length, mean quarter girth, total cubical content ,the year in which it was felled, the site(wynad forest) and the sign that it has been sold.(page 51-52).Even the initials of purchaser is marked. There is a hole in the corner for the drag-chain to pass through.

Blackwood(*Dalbergia latifolia*)for coast market is shipped by purchasers at Tellicherry to Bombay and Karachi markets .(This was the ancient route by which it reached Indus valley).

Close to Begur he see a flame of *Poinciana regia* in bloom. Logan see 70 logs of teak in a depot all prepared by Kurumbars for the company to sell and make profit .He see mighty rosewood (*Dalbergia latefolia*),wild dogs(*cuon rutilans*)sambur(*rusa aristoletis*)spotted deer(*Axis maculates*)pig(*Sus indica*).

Logan writes:-Just look at the magnificent trees here. And no wonder they are so fine ,for the soil is a deep rich loam, nearly black, and composed entirely of the rich surface –soil washed down from low hills around the monsoon rains. The rainfall is about 80 inches here. There stands a magnificent teak surrounded by thousands of Mutty trees(*T.tomentosa*)and venghai(*Pterocarpus marsupium*)and venteak(*Lagerstroemia microcarpa*) rosewood (*D.latifolia*)and just off the road a monstrous fig(*Ficus mysorensis*)

that was blown down in the fearful monsoon gales of 1882. A famous tree it was too, known amongst the kurumbas as the great “Goni Barray”. Its branches bore twice a year a rich crop of wax and honey, for over a hundred colonies of large bees (*Apis dorsata*) have resorted for years to this mighty tree to rear their broods in fancied security

.
The handsome black bird which sings and is tamed by Mohammedans is the Bheemaraj (*Edolius paradiseus*) and it has power of mimicry and mew like cat, cry like baby, cackle like poultry. It has two elongated tail feathers curled into shape of a racquet at the end. A male Malabar trogon (*Harpactus fasciatus*) bronze-winged dove (*Chalcophaps indica*) flame birds (*Pericrocotus flameus*) orioles (*Oriolus kundoo*) blue bird (*Irena puella*) woodpecker (*Picus Hodgsoni*) 50-60 king crows (*Dicrurus macrocercus*) on a willow tree, bee-eaters (*Merops viridis* and *swinhoii*) etc. He takes a bath in Kabanipool and catch some giant carps and mahseer. At sunset watches the imperial pigeons (*Carpophaga insignis*) on an ebony (*Diospyros embryopteris*). A mugger (*Crocodilus palustris*) is seen swimming. Seeing the wodagur women coming to fetch water with shining brass pots poised gracefully on their heads the mugger disappears. A frog crack from a slimy pool. the hoot of a eagle owl (*Bubo nipalensis*) echo from behind.

The gaur (*Garoeus gaurus*) once everywhere in Malabar has been destroyed by Logans time and he mentions it. The cow-bison are now seen in Brahmagiri and Dindamul ranges of hills, in Chedlath and Beni forests and in ghat forests near Peria in Wynad only. Gaur is seen in low country, slopes of western ghat, in palghat Chenat Nair forests. *Felix tigris* is rare in wynad and panther (*F. pardus*) is abundant in Mananthoddy and wild pig is everywhere in the forests. South Indian wild goat (*Hermitages hylocreus*) was abundant once from Naduvattom to Valliyar but have become almost extinct by hunting. He then quotes a lame ibex from Madras

journal of literature and science .This speaks of Malayattur church at Northeast of Alwaye as a very filthy ,little neglected church which is occupied by the converted herds of ibex .He saw 15 males of ibex there ,and compares them to the monastic habits of males but is silenced by the fact that the other sex is hiding behind a bush unseen. Dull as the animals seem they have all cleverness of the priests .(page 60).

The three species of squirrels in Malabar :-Red squirrel *Sciurus malabarica*, which are two varieties one with yellow tip of tail ,other with entire black tail, flying squirrel *Pteromys petaurista*.

(Here I would like to add a few words as postscript of what is said in Logan. In Indus valley and Harappan artifacts the clay figurines of South India ---it is ubiquitous all over north and south India --- is seen and in the south it has a special sacred nature due to the help it gave to Rama during sethubandhana.Sometimes it is the natural geography and fauna and flora which leads to mythology and history and therefore ,each and every citizen of a land should know the land and its features. I have given the excerpts from Logan here for the sake of its positive lessons.

Love nature as it is. Learn the surroundings and know how to survive even in an adversity like a floods or a famine. For this children should be taken to see their own land by teachers and parents and the elders should have enough information themselves. Tourism will develop only if we love our own country, its nature ,and protect ecology .If the beauty of the ecological balance is not preserved, and if the people of the land become hungry of money alone, no tourists will come to such a place .Therefore, at least for your own survival, discard the nature of exploitation and live in balance with nature ,loving it for what it is .)

Educational status 1881 census :(Educational department British Govt)

Taluks	Under instruction	Instructed	Illiterate/not stated	Total
Chirakkal	9486	17772	245411	272669
Kottayam	5567	12764	147444	165775
Kurumbranaad	7944	20206	232874	261024
Wynad	1370	3853	82868	88091
Calicut	6384	18721	180857	205962
Ernad	5114	14823	276206	296143
Walluvanad	7117	19149	281836	308102
Palghat	11018	25703	305733	342454
Ponnani	12769	27762	352123	392654
Cochin	1799	4046	15515	21360
Islands	246	2377	8178	10801
Total	68814	167176	2129045	2365035

The indigenous school system:- Freely attended by girls.(Note this point. There was no discrimination for girls in PreBritish, British periods in native schools)Alphabets,sloka by heart, and singing,amaram,names of all things in heaven and earth and their identification including Gods,men,animals,birds,and rocks and stones and trees (which is morphological classification)grammer,Ramayanam,Bhagavatham,Vyakarana and other sashtra after that. Reciting and singing is a very important part of indigenous system. For indigenous Brahmins there are three Sanskrit colleges two of which in Thirunavay in Ponnani Taluk and Pulayi in Kurumbranad Taluk are in Malabar and Thrissivaperur is in Cochin State. Each presided by a vadhyaan. Vedic scholars in Nambuthiri families:-

Rik vedists	532 families
Yajur vedists	407 families
Sama vedins	7 families

Families Nambudiri Excluded from reading veda 71 families

Vedic namboothiri settlements

Taluk	No:of families	Rk	Yajur	Saama	Excluded/uncertain
1 Chirakkal	79	3	76		
2.Kottayam	30	4	26		
3.Kurumbranded	70	51	19		
4.wynad					
5.Calicut	152	8	144		
6 Ernad	120	10	85		25
7 Walluvanad	277	192	40	2	43
8.Palghat					
9.Ponnani	289	264	17	5	3
10 .Cochin					
Total	1017	532	407	7	71

The study of different sciences seems to have descended in particular families and astronomy is particularly given much attention and the knowledge is fairly exact ,Logan notes. They have a monopoly over learning and it is their knowledge which secured them such a commanding influence according to Logan.(Please do note this statement of Logan before saying that before Europeans came the natives knew nothing at all. They didn't know English ,one can say .But they knew quite a few things including educational psychology,sciences,logic etc one has to understand.)

Castes according to Logan:-

He quotes some observations in Madras census 1871 report of Surgeon general Cornish which is very important for us to understand .The great division of labor into professional, personal,commercial,agricultural,industrial and non-productive services has been noted. And rightly observes that the people of India originated from a common parent stem and due to division of labour,and regional languages were divided into several tribes and castes. If it were necessary to sum up the law of the country as it stood before the Mohammedan invasion(1766AD)and British occupation(1792 AD)that word would undoubtedly be the word custom(not caste),Logan says. In Malayalam it would be Maryada.margam,aachaaram all signifying established custom .There is no indigenous word either in Malayalam or in any other Dravidian languages to denote caste.Jathi ,in Sanskrit is from janma or birth and that law which is natural custom to each birth .(For example manushyajaathi,mrigajaathi,pakshijaathi etc).The Tamil and Malayalam word for it is Peru, as in nir-atti-peru(right from water deed)and is equivalent to janmam.It does not define caste .Kaaraalar,kaaranmai is a trust and a co-operative duty ,which is entrusted to certain citizens according to a deed ,and they are supposed to fulfill that duty in a body politic. The nayars were the protectors of the country ,crystallized readily into this duty with several branches of them. Their function of supervision (kaanam)remained unimpaired down to the time of British occupation. Logan observes that due to the ignorance of the British courts of justice ,the term has quite lost its proper signification.(pp 111 vol 1)The nayars were also the vellalars (irrigators).They had to respect the kon,or perumal,and was a protector of the interests of guilds of the nation and all such rights were given to jews,Christians and later to Islamic people with sanction to make their own palli (educational and religious center for such guilds).The system of sharing has survived in agricultural industry alone at present. Logan notes that it extends to all classes of community ,no matter how humble they are. Logan feels that question of caste and occupation has to be addressed together. He says:-It is unfortunate that such an essentially European classification of occupation has been adopted in the census returns ,for it is only confusing .What ought to have been done was to have adopted the four great divisions into which the Hindus themselves say they were originally divided:

- 1.The sacrificers ,men of learning
 - 2.The protectors and governing classes
 - 3.the traders and agriculturists
 - 4 the service classes. To this a fifth is added
 - 5.mechanics and handicrafts men.
 - 6.Those who does not fall into such groups should have been grouped as a miscellaneous group.
- Logan attempted such a classification (see page 114 -115 vol 1)as follows:-

Division 1.The sacrificers (God-compellers)and learned .

Brahmins .Malayali and foreign
47683

Division 2

protectors and governing classes
Maravan (watchers/temple sweeper/musicianTamil
136
Mutratcha (watchers)Tamil
6
Nairs(militia)
321674
Rajputhra
362
Total
322178

Division 3

A.Traders

Baliya (telugu)

1466

Komati (tamil)

1096

Shetty(tamil)

20945

Vaniyan and gandlu

42781

Vanniyan(tamil)

1259

Total

67547

B.Agriculturalists.

Agamudayan (tamil)

184

Golla(Idayar)herdsmen

2889

Gouda(herdsmen)

1062

Kurumbar(shepherds, jungle men)

2062

Kuruba golla (herdsmen)

16

Padayachi(tamil)

1008

Reddi(telugu)

119

Chanan,idiga,thiyyan,ilavan(planter)

559,717

Telugalu (vadugar)North countrymen

7811

Vellalan(irrigators)

7525

Yadavulu(telugu)

24

Total

582417

Division 4 service classes

Palli(ploughmen)or pallichaan

40809

Parayan (labourer/leather worker)

93612

Ambattan(barber)

8347

Odder(east coast tank diggers)

1682

Upparavan (same)

1

Vannan (washerman)

37556

Total

182,007

Division 5 Mechanics and handicraftsmen

Devangulu(telugu)

10

Kaikalar(weavers)

20465

Kammalar(asari,moosari,karuvan,thattan,kollan)

51553

Kummara(kusava)potter

11770

Madiga (leather worker)

181614

Saleeya(weaver)

21589

Seniyan (Tamil weaver)

486

Total

287487

Division 6 Miscellaneous

Ambalakkaran(Tamil chief of the Kallars)

27

Valayan /besta(fishermen)

16024

Lingadhari

71

Kallan (Tamil .Chora/chola robber in hilly areas)

47

Shembadavan(fishmonger)

167

Others

162175

Not stated

1441

Total

179952

Grand total

1,669,271

If this was adopted many of the present confusions would have been avoided regarding the caste system which was created unnecessarily to divide the nation .Page 117 gives a table of occupation of the census 1881 .It is interesting that the women participation in it as house wife is only very minimal.(The number of Brahmins and Kshathriya are minimal .Kottayam and Parappanad are called Porainaat adigal and Logan thinks that it is

because they are foreigners. Actually, Porai means hill, and they are kings of the hills (Betta raja or vedda kings) and the Parappanad family provides consorts to all other royal families of Kerala. Thalappalli was part of this but since one of the kakkad kaaranavars murdered a perumal, according to the wish of the naattukoottam, he was downgraded from his sooryakshthra/ Brahmakshathra status to a Nambidi and after that they ceased to have intermarriage with Travancore and perumpadappu, their cousins. The downgrading was due to the act of dishonest killing (Himsa) and not birth.

Occupation census 1881:-

Occupation	Male	Female	Total
1. professional			
Government	7206	57	7263
Defense	2274	-	2274
Learning, literature etc	27657	14588	42245
Total	37137	14645	51782
2 Domestic			
Wives	-	866	866
Personal offices	5793	6001	11794
Total	5793	6867	12660
3. Commercial			
Money, house, goods, dealings	16968	2304	19272
Carrying goods	32299	2133	34432
Total	49267	4437	53704
4. Agricultural			
Occupancy of land and agriculture	346868	228631	575499
Care of animals	13082	3948	17030
Total	359950	232579	592529
5. industrial			
Art & mechanics	19673	417	20090
Textile fabrics, dress	30097	61973	92070
Food, drinks	72632	52998	125630
Animal substances	705	1599	2304
Vegetable substances	27830	14030	41860
Mineral substances	65708	6742	72450

Total	216645	137759	354404
6.indefinite & nonproductive Labor(specified)	29066	18081	47147
Rank and property(swastham)	31	30	61
No specified occupation	476385	776336	1252721
Total	505482	794474	1299956
GRAND TOTAL	1174274	1190761	2365035

About Nair women Logan says:-Though the law sanctions freedom in relations ,conjugal fidelity is very general. Nowhere is the marriage tie –albeit informal-more rigidly observed or respected, nowhere is it more zealously guarded or its neglect more savagely avenged. Nair women are as chaste and faithful as their neighbors ,just as they are as modest as their neighbors ,although their national costume does not include some of the details required by conventional notions of modesty

Land tenures in Malabar:-

The unit is family and not individual. The association of families form a body corporate like a gramam among Brahmins, a thara among Nairs,the cheri among theeya,and other foreigners.(It is interesting that Nalapat had the family name Nalapat Cherikkal as they belonged to the sons and daughters of the perumal in a woman from the northern part of the country. But we also find the term cheriikal as the people and land belonging to the side or chery of the king in a particular part like venad,or kochin and also as a group of people belonging to cheruma/paraya.Thus the term is not restricted to one group)These guilds of families and groups of families had separate occupations or function to be performed.The chief agricultural guild were called vellala or those who have ruling right over water ,canals, rivers and oceans. The nair and theeya were the bulk of the agricultural population.One had extra function of warrior class and protection and the other too had the function in some regions as Chekavar.Nayers as keralolpathy says were the eye, the hand and the order and the duty to preserve dharma was in them. So both agriculture as well as defense were equally important for them Supervisors or kaanakkar and kaanam rights were entrusted in them Kaanam is a word from Dravidian kaanuka or to see. The root of which is eye or kan.they were the overseers and their kaanam rights or kaanam fields were always in sight of their house or tharavaaad.This was a special right of the nayar .Kaanam right is not a possession or mortgage but a right of supervision or a special function for which a special allowance is given to the nayar.Logan quotes a deed showing that kaanam is under the six hundred(arunoottuvar)and the king and kaanakkar is the ruling authority or the paad (like nambuthiripad,bhattathiripad etc)for ancient land revenue assessment (paattam).(Naalappaatt or pad is a term in relation to this.While Chulali ,had a more military function,Naalaapaat /nerpaat was given a more agrarian and supervisory function of all the four sides of the kings territory and was located at the southern part which is Nalapat cherikkal in Uliyannur grama extending upto churnikara.) Chulali on the other hand was given charge of the Northern part of kingdom.(With Purainaattadi/Wynad/Pazhassi area).

What is the duty of kaanam?The kon and pathi had shares of produce as owners of the land. The rights of this in 9th century was paattam and this term still survives as Logan points out. The paattam is a word signifying the pad or authority's vaaram (share).Logan quotes the words :- "The anchuvannam and manigramam protect the citizens in every coming generation ,that in the space within the four gates and on the spot where land for sale is given in trust the palace having received the kings title ,anjuvannam and manigramam gets the kings title "(Page 598)Thus the Christians and jews given this right was associated with the 600 Nayar supervising authorities under the King as the Lord .All the rights of the Nair was given to the jews and Christians too by the deed. They too

therefore get a pati or the share of the produce from the common fields. It is giving the land in trust to the proper workers who belonging to a body politic will improve it and give the produce share to king, enjoying a share themselves and the rest of share for the society in various proportions as assigned by the law of the country. The nayars had to supervise that no land falls to disuse and maximum production is achieved and the product reaches safely to the site where it is sold or bartered by the king etc.In short they were agriculturers,protectors of treasury and granary and defense force and sons and citizens of the king and such rights being given to foreigners means they had been trusted by the king as well as by the nayars .Otherwise it would never have been allowed .The nayars had to collect the king share or the public land revenue and give it back to the king and at the same time see to it that the farmers are not put into difficulty in famine or other natural calamities etc .These functions made them the major administrative and trading and agrarian guilds with three functions (kshathriya,Vaisya mainly)at hand.Thus,it is seen that this system of Malabar was prevalent in olden times in entire India and before advent of Tipusultan there never had been public land revenue in Malabar (Page 599)By 9th century when perumal rule was dissolved, there never was a superior emperor in Malabar and the local kings were the Lords to whom the nayars and their corporate capacities of powers had to rest.

The hereditary nature of a janmam deed is from its neerattipper which Logan thinks is from peruka or to deliver a baby. But in Dravidian language it means to get or achieve .It need not always be a child's birth. It just means origin of something, including a deed .The deed is made with water showing the power of vellaalar (the one who rules the waters .The title of sathavahana were samudradhipathi).In 25 deeds from 5th century AD to 13th century AD Logan see the word neerattiperu for giving a janmam deed. It was done in Bhagavatham times with Mahabali giving land to Vaamaana and is a very ancient practice. Logan points out that ,if this custom is that of Vedic Brahmin nambuthiri and the belief that he came only in 8th century to Malabar does not tally at all. The share went to all the 600 people and their families and to the king means the co-operative farming on large lands was being done and it needed lot of knowledge and supervision and experience and support from all and this was the function done by the guilds .In Malabar the perumal rule abruptly ended by AD 825.Kochin state ruled by the last perumals heirs after that continued to get the muppara (3 para per 10 para of produce on wet lands)and ettukkonnu(one in eight produce in garden land)and this was the original share of the kon or perumal .This was the only public land revenue that existed in entire India or at least in

the Kerala /South India .In 1766 AD when Mohammadan invasion occurred Logan points out none of the malayali chieftains were levying regular land revenue .These janmis had a share of the produce as revenue and it was more or less like a barter between the king and the people. The janmis transfer had become an ordinary ryot in Travancore on purchasing the janmam rights of cochin and other rajas .They were strong in their domains than the Malabar chieftains who had lost strength after the last Perumal rule. In Malabar the janma was bought and sold even before the Mysorean invasion and the wordings are significant and Logan says the British missed the significance of wording .The rights of the soil is given in detail and relinquishes all rights of the seller on it. But these are not mere physical objects but the authority on the desam,the battle wager, the rank ,and customs

,heaven and earth above it,etc etc ,and the temple ,and a seat of honor in the temple feasts, management of temple affairs, the temple wetland management ,and labourers,The tharawad wetlands,gardens,workers,house sites etc .the desam,temple and thara authority also are conferred .This is not the idea of the western mind at all as Logan points out. The authority was associated with the duties to be performed to the society as well in the deeds .Not on soil and produce alone but on protection of the land and its people and in living co-operatively as a family sharing every thing with them. The sthaanam maanam is associated with land deed. Logan writes:-European looks at soil and nothing but the soil ,Malayali looks at the people located on the soil .This trust and share is part of the entire Hindu system and its outcome ,He writes. The essential difference of a Roman dominus and a Malayali janmi was not perceived by the British ,Logan says. They converted by civil courts the janmi into a dominus first and the reason for the deplorable condition of the workers was this .(pp 604)

Another observation of importance is that the Nayar protector guild collected the revenue for landlord as accountants(kanakkar) as share of produce ,and gave it to janmi. Sometimes in times of need the Janmi/king/landlord borrow from the guild (in times of war, famine ,etc)and it is deducted from paattam(padu/varam/share).The interest or pallisa was at customary rates and balance of produce alone went to janmi.Thus people as guild had a role in revenue and its payment of share through the guilds .If the borrowing is too great it will wipe out janmi's share of produce.(This is how the share of kings reduced during British rule).In that case the kaaanakkaran's interest becomes an otti .Even after the janmi loss the share of produce he has rights over people, living on his land, and it was customary to value the remaining right at one half of what was already advanced to purchase the otti.The deeds by which transactions were effected (pp 604-608)

- 1.ottikkum purame ulla kaaanam.Jnami borrow 10% more on sum received for otti right
- 2.Nirmuthal.Another 10% on money already advanced for otti and ottikkum meleyulla kaanam.He pledges the right of nir (water)to his creditor
- 3.janmapanayam.pledge of janmam right. Another further advance made on sums borrowed and there is one step beyond this and that is conveyance outright of janmam right.

The janmi first mortgage full value of his own share of produce. But what he pledges is not the soil, but only his share of the produce, and after that his other incomes and emoluments attached to status of janmi. Logan says civil courts set up by British thinking that the pledge is the soil as in the case of Dominus, completely upset the system of customary sharing of the produce. What I want to stress is that we are continuing that process and making life of agriculturist difficult thinking that we are doing the right thing. The periodical renewal duties and fees were a source of income for janmi/king. The succession duties of Purushantharam were like this. This system of succession also was changed by British civil courts and annexation of kingdoms followed indiscriminately. There was a system of kulikkanam which Logan calls admirable. Any agricultural labourer could cultivate the land that was already reclaimed and also constantly reclaim fresh wastelands for cultivation to increase production. The customary sharing of such Kulikkanam reclaimed plots was at the end of 12 years from the time the land was taken up. Upto that time the labourer/cultivator enjoy the full produce. All that he has to pay was a trifling fee of 2 fanam(panam) about 9 annas for entry into the soil. This was there for kings also. (not only for laborers).

The longer the janmi and cultivator/saamantha lived, the succession rate also was only at very long intervals. And the rate of succession was only 13 %. Logan says (page 607) This system which is a necessary result of Hindu social organization was evidently conceived in much wisdom for protecting the interests of the cultivating castes. And he describes how here again the European view of property laws upset the custom. The system that a tenant making improvements in soil, holdings had special rights whether a cultivator or a king is to be noted. A cultivator or king could not be ousted without a decree of thara /assembly and the people's guild was controlling this dharma. Thus kaanam and kulikkanam tenants were practically permanent tenants though the common right of the land was in the janmi. It was not personal property of janmi, in short. Thus it was a co-operative farming system with special laws to protect all and the economy of the nation as well.

On 5th Feb 1881 Mr. W. Logan was appointed as special commissioner to inquire into land tenure and rights in Malabar and he visited all Taluks except Wynad and on 18th June 1882 submitted a report. The abstract is given as follows:-
When Mysorean attack of Hyder and Tipu happened there was first disturbance of customary laws. Tipu assessed with an ordinary Indian land revenue settlement. They took paaattam (share of the padu or king) as paattam which encroached share of kanakarar and janmi. But he kept the customary share of cultivator intact. He took as king or landlord 10 % of pattam on wetlands of Cheranad and 100 % on garden land of entire south Malabar. They did this to weaken the royalty and their army, the Nairs. (Till then all conquerors took whatever is customary for the landlords only). The 10% of revenue at Cheranad was commuted to Rs 250 per 1000 Macleod seers. In other areas 50% paatam of wetlands (Kadathanad) commuted to Rs 40 per 1000 Macleod seers. In reality this 10 % assessment on Cheranad was severe and heavier and when taken in money, than the 50 % taken from Kadathanad. The money rates imposed by Mysore sultan and later by British, caused the following (pp 609-610):-

1. Wet lands 86 % of the paattam

2. Coconut gardens 67 % of paattam

Areca nut gardens 53 %

Jack tree 69%

Total 189

Average for garden 63 %

3. Modan lands about 32 % of gross produce

Punam 42%

Ellu not available

(Special commissioner Graeme found it as wetlands 90 % and garden lands 62 %)
The land revenue was made by Tipu and the lower ranks of the kanikkar or cultivating farmers who were the only people there since all janmis and Nayar chiefs had fled from Malabar when they attacked.)

Mr. Farmer described the ancient system as:-From the quantity of seed the produce was calculated according to the quality of the soil. Of this produce $\frac{1}{3}^{\text{rd}}$ is allowed for the farmer for his maintenance ,profit. $\frac{1}{3}^{\text{rd}}$ for expenses of the Tiyars ,cherumars or cultivators attached to soil, only $\frac{1}{3}^{\text{rd}}$ went to the janmi. Produce is net produce and all parties were getting equal share of the produce. In Mr. Jonathan Duncan's interview with Mappillas they told him" Since Hyders time the right of jenmkaars is taken or absorbed by Government. And the Mappilla kanakkarar were paying nothing to the janmis except what they gave them out of charity.(see page 611).Nothing had been reserved for the janmis in making the Mysorean land revenue settlement and denied that janmis had right or entitlement to anything.

Logan thinks this is the beginning of the serious misunderstanding of the janmi's true position in regard to the land. And this has produced all hardships to people /classes beneath them. Logan says when all kings/janmis fled with their Nairs to Travancore the Mappillas got absolute ownership of the land /soil like the European ideas. They advanced small sums of money and to obtain deeds assigning to them large kaanam rights. Logan says if janmam meant dominion and if kaanam meant a mere lease for 12 yrs ,they would not have made such shrewd bargains. The kaanakkarn was the real owner or janmi and the janmi/landlord/king was namesake and they knew that. But the previous kaanakkarar were part of a guild, part of a dharmic assembly of protection of the laws of land while these were not .Thus the system crumbled. The joint commissioners of North Malabar and South Malabar wrote about the behavior of the already weakened kings and landlords as avidity to amass wealth ,acted as scourges and plunderers than as protectors of their respective little states. From 1792-to 1802 the state was in a series of disturbance ,rebellions ,robberies and Mapillas had a conspicuous part in them.(Pazhassi Raja rose to power at this time. So the reason is obvious))

In 1803 Major Macleod became the first collector of Malabar. He entrusted Mr. Richards the first judge of Malabar to solve problems. He called all principal janmis of south Malabar to fix a Govt share for produce. Logan tells us the mistakes of Macleod (pp 535) including a statement of Mr. Rickards that if the principles of his land revenue is applied indiscriminately to seed lands in Malabar, I am confident that agriculture would no longer be worth pursuing. His estimate was farmer has to give per coconut tree 48 nuts to Govt, and per arecanut tree 200 nuts. Graeme made it per coconut tree 24 ½ nuts and per arecanut tree 150 ¾ nuts. In 1802 Oct 11th Edachena Kungan kills a Govt peon who wanted revenue from a kurichiya and he and Thalkkal Chandu become rebels in the eyes of British Govt (under Pazhassi Raja). The net produce was ascertained in the customary method. Then divided as:

Wet lands	Garden lands
1/3 rd to cultivator	1/3 rd cultivator
2/5 th to Govt	1/3 rd Govt
4/15 th to janmi	1/3 rd janmi

Miscellaneous lands –Modan, punam, ellu was divided as 3/5th gross produce to cultivator, 1/5th to Govt and 1/5th to janmi.

Even Richards did not realize what net produce really meant according to Logan. Graeme reported the customary shares of the produce deducted at the time of harvesting, threshing, and for the carpenter, blacksmith etc all will account for 20 % of gross produce and after reducing this from gross produce only should be divided as shown above. This was not known to the Richards commission. The scheme also failed to provide share for kaanakkaran and they were not consulted at all. He used to get the same share of 1/3rd but now he was a mere mortgagee, an investor of his money and he had to look after his own interests and investments and had no role in the guild or in the dharma protection etc. (Thus, when a king call them for war purposes etc they started to go for the one who gives more benefits. Dharma, trust, honesty, values deteriorated and people as well as kings changed loyalty and became opportunistic.) The janmi /landlord/petty kings became fully recognized as the Lord of the soil after the European fashion (Logan pp 614). Kanakkars became least interested in Govt affairs and became interested only in their own affairs. In 1831-32 prices rose to 15%. Next year another rise of 12%. In 1834-35 price of garden produce increased. 1856-57 grain price recovered. from 1852-53 to 56-57 the marked price rise occurred. (The year of the mutiny). The first Mappilla rebellion was reported in 1852 by special commissioner Strange (pp 615). Till 14th September 1857 thirty-eight of such were reported. This had something to do with the price rise and market value of grains and garden produce rather than with any protection of laborers rights.

From a brief sketch of Logan's report on land tenure we have

1. The original Malayali (and hence Indian) system of land tenure as a customary sharing of the produce, each customary sharer being permitted the free transfer of his interest in the land

2. Under British rule one of these customary sharers had been exalted into the position of a European proprietor holding the plenum dominium as the Romans called it.

3. The other customary co-sharers were pushed to the wall, and do not now receive their customary shares, and their right of free transfer of their interests has been virtually expropriated.

4. The insecurity of the ryots thus occasioned has resulted in fanatical outrages by Mappilla and in a great increase in crime.

Ponnani Taluk during British Rule (as per Logans Malabar Manual vol 2 .Appendix XX1)

The southernmost Taluk of Malabar, formerly comprised of Vettathu Naad, Kudanad, and Chaavakkad which were amalgamated into one in 1861. Boundaries :- In North the Ernad Taluk, East Walluvanad, and Native state of Cochin. West Arabian sea. The district was not surveyed when the manual was prepared and exact area not known. Approximate area according to 1881 census was 258154 acres or 404 sq miles. North south length of the Taluk along the coast is 64 miles and width range from 3 to 20 miles in different parts. In comparison to neighboring Ernad and walluvanad, it is flat along the coast while inland low hills with scrub jungles, grass, and flat rice fields interspersed with groves of coconut, arecanut, jack and other trees surrounding dwelling places exist. Coastal soil is sandy and the open seaboard is fringed with groves of coconuts. There is no granite in shores but in interior formations of gneiss traversed by granite veins prevails which is seen in adjoining two Taluks mentioned and they were One.

Inland water communications:- A series of lagoons and backwaters lying in zigzag fashion along coast with a few canals which are manmade affords easy inland water communication. It extends from Tirur southwards to Ponnani, Chowghat, Cochin and then to Cochin and Travancore states. The total length of this inland water navigation from Tirur to Cochin is 93 miles (of which 77 lie in Ponnani Taluk).

Tirur –Ponnani section is 16 Miles. Ponnani to Chowghat section is 17 miles. Chowghat to Cochin section is 60 miles. Common country dug-out boats are used for cargo and passengers. They are manned by two people and can carry from 5 -20 people. Maximum charge per mile is only 2 Annas and average speed is 2 ½ miles/hour. Transit is both by day and night. (This is important). The occasional cabin boat has average speed of 5 miles/hr and charge 3-5 Anna more depending on size of boat. Cabin boats cannot travel in dry seasons in certain parts. In addition to chain of back waters the Taluk has the Ponnani river and a few minor streams. Timber from Anamalai and Mannarghat forests is floated down the river in rainy seasons to local timber merchants depots and to Cochin Government.

Logan mentions two large and shallow lakes in the Taluk. One is “Viyyathil lake” situated about 3 miles east of Ponnani, and the other usually known as the Trichur lake is about the same distance east of Chettuvai, and 8 miles from Chowghat. They are respectively connected with backwaters communicating with the sea at Veliankod and Chettuvai. Protected by strong artificial dams from tidal influences the beds of both the lakes are to a considerable extent cultivated with paddy after the monsoons. The Viyyathil lake lies entirely in Ponnani Taluk, while the greater portion of the Trichur lake belongs to Cochin state. The average extent of such cultivation and the amount of revenue derived in the former (Viyyathil) are acres 7920 and Rs 10865. From the other, from part belonging to this Taluk acres 2292 and Rs 2960. (Note that Viyyathil lake is now misnamed as Biyyam by a mispronunciation of the V for B. How this occurred is immaterial here. But the fact is that Viyyathil in Tamil has a meaning which is very important for history. It means the Vaiyyakam or Bhoomi and the lake of the bhoomi (Vaiyyakam) and its proximity to Bhaaratahpuzha, the only river in Bhaarathadesa with that name is often overlooked. The other lake is the Enamaakkal lake).

Climate along coast is temperate throughout year, and in interior adjoining parts of Ernad and Walluvanad, it is hot in months of April and May (as in other parts of Tamil Nadu). Metereology shows rainfall as follows from 1878-85 for eight years, in inches.

Yr	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Tot
1878				10	10	39	23	32	18	9	5	1	147
1879			2	2	25	17	21	14	6	9	9	5	110
1880			1	9	6	22	26	5	3	5	6		83
1881					3	11	10	15	5	4	10		66
1882				1	15	30	32	9	9	12	8		119
1883			3	2	18	24	25	16	4	9	10	1	112
1884					3	26	20	16	12	8	8		93
1885			3	1	5	37	29	15	4	15	4	3	115
Total	0	0	9	25	85	206	186	212	61	73	60	10	840
Average													105

The health of people is good. Water supply also is good especially towards interior parts but is unsatisfactory in towns of Tanur and Ponnani. Sanitation of towns is looked after by one sanitary inspector, one maistry, 13 sweepers and one scavenger (Thotti) by local funds.

Population:-This Taluk ranks first in population. Total (including floating population) according to 1881 census :-392654

Males 194150

Females 198504

Hindu 231402 (59%)

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Mohammedans 146868(37 %)

Christians 14363(4%)

Other classes 21.

% increase compared with 1871 census:-

4.77 % in Males and 4.78% in Females .

Total increase 4.78%

Average density of population to square mile 972 and in this matter the Taluk ranked second in the District ,the first being Cochin. Proportion of males to females was in the ratio of 496.5 to 503.5 in every 1000.

Houses 78148 in number.

70625 occupied. Remaining 7523 unoccupied. Average number of persons per house is 5-6.

Generally the people are poor. A few rich and a few medium .The occupation according to

1881 census:-

Professional	5750
Domestic	1306
Commercial	8696
Agricultural	88509
Industrial	65652
Indefinite	222741
Total	392654

Imperial license tax collected in 1885-86

Trade dealing, industry	No:of persons charged	Amount of assessment
Money lending	103	1520
Cloth bazaars	6	90
In paddy	5	90
In coconuts	5	50
In coconut oil	5	50

In rice	2	20
In fish	2	20
In salt	2	20
In tobacco	2	20
In timber	2	20
Boat rent	1	10
Miscellaneous	3	30
Total	138	1940

For administration Taluk was split into 73 Amsams. The revenue work was by an

Adhikari having civil and criminal jurisdiction. The civil power only for suits not exceeding Rs 20 and criminal to petty cases of assault and theft in respective amsams. Tahsildar had general revenue charge of the entire Taluk had two Assts (Deputy Tahsildar) at Vettath Puthiyanghadi and Kuttingal, and Tahsildar's office was at Ponnani. The Assts were given charge of 21 and 28 amsams respectively. They exercise judicial powers in these amsams and Tahsildar on the remaining amsams. The Taluk formed a separate revenue charge, designated the southern division under a general duty Deputy collector with magisterial powers at Ponnani as his HQ.

Agriculture:- Staple produce is coconuts and paddy which is largely cultivated. Extent of Government and Inam lands in acres given below:-

Type	Government	Inam
Wet lands Nanja	71137	3625
Wetlands Punja	13782	21
Garden lands	57872	1881
Total	142791	5527

The total area of cultivation is 148318 or 232 square miles, or a little more than 57 % of total area of the Taluk (taking it as 404 sq miles). The extent under garden land being 40 % of total area under cultivation.

Demand roll of assessment of lands:-

Amount of patta	No: of holdings	Assessment (Rs. Anna. Pai)
Under Rs 10	31076	82263.8.2
Rs 10-50	5240	107195.10.7
Rs 50-100	684	47105.5.0
Rs 100-250	316	45461.14.2
Rs 250-500	52	16553.14.1
Rs 500 and more	15	12236.2.11

Total	37383	3,10,826.6.11
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Revenue for Taluk for 8 Fasli years:-

Yr	Land revenue	Local fund	Village service fund	Abkari	Stamp	Special fund	Licence tax	Land reve.misc ell.
1288	306549.15.8	40382.5.6	19729.12.9	7540.8.0	59344.0.0	278.5.6	3577.0.0	7926.10.7
1289	308525.5.0	40100.14.3	19470.15.7	7177.4.0	91537.0.0	248.9.6	1250.0.0	2627.5.11
1290	308042.5.0	40016.3.11	40165.15.2	19445.4.2	88868.5.0	232.4.0	1940.0.0	2677.8.8
1291	309254.6.4	40165.15.2	19445.4.2	5513.14.8	86396.7.0	357.14.6	1730.0.0	4184.0.11
1292	309195.11.9	40219.6.8	19459.10.9	7492.0.0	81146.9.0	300.12.8	1645.0.0	3386.0.2
1293	309240.5.7	40229.1.3	19352.2.10	8900.0.0	86431.3.0	324.13.6	1910.0.0	5204.0.4
1294	310543.3.7	40384.12.8	19466.5.1	8100.0.0	95909.6.0	399.30.0	1955.0.0	4802.10.7
1295	310816.6.11	40372.1.4	19472.4.11	10350.0.0	102142.0.0	339.4.6	1940.0.0	4532.10.7

From the above ,it is seen that a total of 4018326.21.114 is obtained from land alone(as Paattam assesment,land revenue and miscellaneous land revenue) from the people of Ponnani Taluk.(The other taxes and funds are not considered here but they also has become an increased burden on already burdened .people).

Important towns:-

1.Thanniyur (Thanni or Terminalia bellerica a medicinal tree for Thribhala which was famous ,as shown by Avicenna's medical text in 8th century AD in Arab countries and was in great demand along with kadukka and nellikka).This is in Rayiramangalam Amsam(of Narayanath Branthan ,son of Vararuchi 5th century AD).Keeswaram or Keralaadheeswaram temple is in this amsa.This is one of the most ancient temples.In Pariyapuram amsa,nearby is Thrikkayikkat temple of Shiva,Bhagavathy and Ayyappan .Thrimurthy and Narasimha are painted on srikovil with two sculptures of Dwarapalaka.This is a small port town.

2.Vettathu puthiyanghadi(the vettathu Rajavansa became extinct in 1793 when its last Raja died). Logan says the Jamath mosque there in Thalakkad amsam has brasscovered Gopuram,and a granite slab on one of the steps of Northern gates bearing an inscription.(not deciphered).Garudan koil at Vellamassery desam of this amsam and Thrikkandiur Shiva temple in nearby Trikandiur amsam (founder ParasuRama) is mentioned by Logan.

3.Paronna (Paravanna) former residence of Paravanur Panicker ,a desavali is a village near sea, in Pachattri Amsam .

4.Kodakkal. due to presence of megalithic umbrella stones there. It is in Tripranghod amsam 2 miles SE of Vettathu puthiyangadi with a weaving(Chaaliya)establishment. Important temples like Thripranghot,Hanuman kavu,Thirunavayi Vishnu ,and Chamravattath Ayyappa are there. The first two in Thripranghot (Thiru Paravan kot)amsam. Thiru is sri.It is a shiva temple.Srikovil is 105 ft length X 75 ft breadth.The raised stone foundation of a pillar of the building consecrated to Krishna shows a long inscription.(not deciphered).Sankhaabhishekam is the most dear offering to Shiva.It gives prolonged life, and is connected to story of Markandeya.Thirunaavaaya was founded by the nine yogins and is on North bank of Ponnani river on the road from Vettathu puthiyangadi to Thrithaala.Mahamakha is conducted there every 12 years.During the 28 days of the festival ,the throne of the king is declared vacant and selected number of followers of king(Zamorin)and the rival (original claimant) contestant of throne ,well trained fight .In 1743 the last one of its sort happened. There is an othanmar madham for teaching theology there. A temple of Brahma exists nearby which is very rare.(It is important to recognize that Logan though he is not a Indian or a Hindu did not hesitate to record even the worship ,customs and the local names and he didn't think that these religious practices are myths to be discarded ,but as local subaltern(if you want to call it like that)history of a people .)Near Chamravattom ferry on a small island on way from Tirur to Ponnani is the Ayyappan Kavu.This is a God with special powers for giving rains.

5.Koottazhi(Kuttayi) is a junction and a bar as the name indicates. The backwaters along coast of Thirur and Ponnani united here and communicated with sea formerly. hence the name. In the Mangle Amsam near sea,4 miles to southwest of Thiruranghadi and with a place called Nechikkat(for jungles of nechhi bushes ,it is a sacred place for Mohammadans.

6.Ponnani (Ponnanayam)or gold coin .Gold coins circulated here and Arab and Persian merchants came here before Europeans found sea route via Cape of Good Hope. The Kudanaad District Magistrate court is here. The mosque for study of Islamic theology was built there in AD 1510.(by Said –ud –din Makkadum)and those who get a scholarly knowledge from here are called Mussaliars.(Because of a Mausoleum/jaarrum there).The Makkadum alone gives that title.Ponani is a seaport and timber ,bamboo, coconuts,coir,local imports of salt and rice are traded. A mile and half to the town is a sathram or Musafer khana. ½ a mile south to town is Thrikkavu in Pallapram amsam with a historical Durgha Bhagavathy temple. Founded by Parasurama,it is in Sukapuram grama ,one of the 64 gramas of Brahmins.Tipu plundered the temple and broke idol to pieces and used srikovil for his halting place. The former owners took refuge in Travancore,and they came back after restoration of country. They repaired and installed idol. In 1861 AD Zamorin repaired the entire temple. Another Vishnu temple is in its vicinity ,the history of which is interesting, says Logan's manual. A chetty and a mussalman ,while in a sea storm ,promised to build temple and mosque here ,and they

were saved and this temple was built by the chetty and the jamath mosque by Muslim simultaneously.

7. Edappal, 5 miles east of Ponnani. In the neighboring Vattamkulam amsam is the Sukapuram temple. Founder is Parasurama and deity is Shiva as Dakshinamurthy. Registration as a person who performed yaga takes place once in 12 yrs and it is one of the 64 original grama of Brahmins. Roof is covered with copper (of srikovil). In Chekkod amsam another temple founded by Parasurama I Panniyur. Varaha is the deity. Once some of the ancestors of this Grama put a red hot vessel on head of the deity and after that they are not allowed to do veda studies. Granite sculptures and vattezhuthu inscriptions are seen and are not deciphered.

8. Thrithaala: - In Kootaanad amsam. Sathram and a weekly market is there and is on the way to Palakad. 4 miles south of the market is remnants of a old mud fort 200 yard length and 176 yard width. Considered to be ancient. 3 miles to North East of this ruins by side of road to Shoranur from Padinjaranghadi is a small building called Kattilmaadam or kattalimadam made of granite as a Hindu shrine. It is 10 ft square, same height, round dome, formed of a single slab. Tradition says some supernatural agency built it. It was intended as a second story pagoda about 4 miles off in Nethrimangalam amsam of Walluvanad Taluk on the other side of the river and comparison of the existing shrine at that pagoda favor this theory.

9 Velliyamkallu near Thrithala is sacred for Melathur Akkithiripad performed several yajna there. The ancestral rite vaavubali is done there. (New Moon in Thulam and Karkitakam).

10. Chalisseri is on borders of Kappur and Kottachira amsams, 6 miles south of Thrithala. The place is famous for trade of arecanuts and Christians are more in this area.

11. Veliankod. (In veliyankod amsam) 4 miles south of Ponani. The sub registrar office of Andathode in the adjoining Ayrur amsam is here.

12. Kottappadi. The gate of the fort. It is close to Punnathur Kotta of Punnathur Raja, a feudatory chieftain of Zamorin. It is 3 miles north east to Koottungal. Inhabited by Syrian Christians. (with a church). Famous for coconut oil and rearing of country pigs by Christians. The animals are transported to Nilgiris and distant hills for trade. The chieftains and the family still live there.

13. Koottingal, the Chawakkad deputy Tahsildar HQ is in Palayur amsam by the side of canal from Ponani to Cochin., 17 miles south from Ponani. Hindus predominate here. There is a Syro-Roman catholic church at Palayur which is one of the 7 original churches of Malabar. St Thomas, preached at the place. Near it, there is a mound strewn with small debris, still known as the jews church, which was formerly occupied by a building of some kind. There are some old carved stones, including a part of a shivalinga and vattezhuthu inscriptions, spoils of a shiva temple in the vicinity. The modern church of

Palayur is under the Patriarch of Babylon.(Says Logans manual .This is very important. Please note).In Palayur and adjoining Chowghat amsam are two mosques one a 1/4 mile east to Kuttingal, and the other a mile west of it. There is a jaaram/mausoleum in Palayur (of Hydros Kutty) of the commissioner appointed by Hyder Ali, to collect revenue.

14. Guruvayur:- Krishna temple formed by Guru and Vayu according to Puraana,. It is 2 miles North of Kuttungal .The most important temple in the district, and held in reverence by the neighboring native states of Cochin and Travancore. Surrounded by huge laterite walls and 2 Gopurams one in east and one in west. On western gate is an inscription showing the gopuram was built in 922 ME by Panikkavittil Ittiraricha Menon Karyakkar. On eastern gate in granite is a Sanskrit inscription :
-Bhoopaalairvanajaadyai: kalimalahithairarjithaan punyalokaan

Aarooda nishprayaasam nijasukrithajithaan divyasopanamargam
Thungam hrunethraramyam Gurupavanapuresaagratho gopuraagrya-
Vyajenaadhoksham jaaghroukrithamathirakaroschailaavaaraarnidheesa:

Srikovil and mandapam had brass sheet coverings .Temple flagstaff is 110 ft in height having bell metal covering throughout ,save about 9 ft from top, which has gold covering. The shrine wall has paintings of adventures of Vishnu as in Bhagavathapurana.

15. Chittattukara. In Brahmankulam amsam is inhabited by Syrian Christians with a church of them there, and is 4 miles SE of Kuttungal. Coconut and coconut oils are traded.

16 Enamackal is another village inhabited by Syrian Christians in Venkidangu amsam 8 miles south east of kuttungal It is 4 miles in SE of chittattukara (Chittattukara and Brahmankulam is now called Arthatt). In Enamackel is an ancient Syrian church were trade is coconut and coconut oil.

17. Valappad is also a seat of Syrian Christians. In Pallipuram amsam 17 miles Southwest of Kuttungal. A mile to the north of it is Thriprayar in Naattika amsam with a temple by the side of inland water communication to Cochin and belong to Cochin state. The deity is

Sri Rama. On a granite slab on srikovil is an inscription difficult to decipher. Another inscription in Malayalam by eastern entrance says:-

Pazhancherry padanaayarum Thrippurayaattadesathum Peringottudesathum
Ariyaponnidesathum Ooraalarum kaaraalarum nettanm kondavarum koodi
irimpaadathiri,,

Which shows involvement of Pazhancherry Chief commander, Thriprayar desam, Peringot desam and AryaPonnidesa rulers and officials (kaaraals/chieftains) and those who had

nettam(gain/labha /agricultural and trade guild chiefs).

18.edathuruthy.Another Syian Christian settlement 4 miles south of Valappad.

19.Mathilakam (because of the Thrikkanaamathilakam temple)founded by ParsuRama.Dutch destroyed it when they had a settlement in Chetwai.Traces of old temple are still visible.Another Syrian Christian settlement seen in Paappinivattom ansam.An ancient church also is there.9 miles south of edathuruthy is a mosque.

Festivals :-

No:	Festival	No:of days	Malayalam Month	English month	No:of people attending
1	Guruvayur Ekadasi	3	Vrischika	Nov-Dec	5000
2	Guruvayur Aaraatt	8	Kumbham	Feb-March	3000
3	Tripayar Araatt	8	Meenam	Mar-April	2000
4	Thrithala sivarathri	1	Kumbham	Feb-March	2500
5	Thrithaala Aaratt	7	Dhanu	Dec-Jan	2000
6	Tripranghot Sivarathri	1	Kumbham	Feb-March	4000
7	Thirunavaya aarratt	1	Medam	Apr-May	4000
8	Thirunavaya karkatavaavu	1	Karkataka	Jul-Aug	5000
9	Thirunavaya thula vavu	1	Thulam	Oct-Nov	5000
10	Garudan kavu mandalavela	5 sundays	1 st Vrischika to 10 th Dhanu	Nov-Dec	1000 each day
11	Trikkandiyur Thula vavu	1	Thulam	Oct-Nov	2000
12	Keraleswaram Aaraatt	7	Vrischikam	Nov-Dec	1000

List of charitable institutions in Ponnani Taluk

Amsam	Institution	Brahmins+ Traveler(vairagi) fed	Private donation Land/Money	Land revenue grant-inam(Govt)
Vettam pallipram	Chamravattom sathram	492+41	714+-	124.11.1
Trikkandiyur	Vettakoruman	36000+3600	3100+	1399.14.2

	kavu sathra			
Trikandiyur	Tripkrankod samootha	10125	2000+	235.2.1
Rayirimangalam	Keraladeeswara sathra	61200+12240	3819+	2704.13.4
Thalakkad	Vellikulankara Ayyappankavu sathra	5250+750	575+	
Pariyapuram	Ganapathiyankavu sathara	1260	55+	
Nullasserri	Peringhattu oottusathra	4380+1095	60+	
Guruvayur	Guruvayur sathra	29200+1095		
Guruvayur	Thamarayur sathara	4380	+300	
Vylathur	Alakkal barhmarakshas sathra	3650+720	3270+	321.0.1
Naattika	Triprayar sathra	27375+3650	...+3878	
Vadanappalli	Panayamkulangara sathram of Ullanat house	7300+3650	5502+-	
Vaadanappalli	Panayamkulangara sathram of Manhalavil house	2920+365	1000+-	
Kaypamangalam	Mallikakkal sathram	...+1825	..-+228	
Athavanaad	Thirunava sathram	7200+720	...+660	
Unmathur	Kurumhikavu sathram	....	.....
Unmathur	Parakulangara sathram	900+60	300+....	
Unmathur	Kodalil sathram	900	120+1260	
Kodanad	Thrithaala sathram	9000+1080	....
Paruthur	Chembalanghat Samootham Kotikunni sathra	900	300+125	48.10.0
Irumbilium	Perashannur sathram	900	....
Ayirur	Kattupinath vettkorumakan sathram	2555+2160	470+225	
Iswaramangalam	Thirumalasseri kottayil chavatti sathram	.....+1800	....+1000	
Thrikkandiyur	Kumaramangalam subramanyakshethra	9150+2440	...+140	

	sathra			
Koktanad	Asuramahaakaalan sathram	720	.....

A total of 225757 Brahmins and 37291 travellers and vairagins were fed in 25 sathrams in 20 Amsams of Ponnani .For this total inam money from Govt was only Rs 4834.2.9. Private donation in land was Rs 21585 and in money was Rs 7516.

The two comparatively less famous places in modern history ,but very famous in prehistoric,historic sangham period and even during british period as seen above are

1.Alakkal Brahmarakshasan Sathram in Vylathur amsam and 2.the Kattupinath vettekkorumakan sathram of Ayirur Amsam,both of which are in Punneyurkulam ,Vadakkedak panchayath.

Both under the Branch of Mooshakavansa Eliyankaattil Raja of Thalappalli. Ayirur is the village of the five.:ay is also a shepherd or yaadava .(Kaattupinath-Behind the forest or Kaattu is because Eliyankattu kovilakam was behind the Thirutheekkaat parambu ,where the present Nalapat parambu is ,and it was the place of yagna of them. The agrasaala was in the parambu of Ambaazhathayil ,seen as Agryath parambu.) Sathram means a yajna or a sacrifice. And giving food as a yajna was the rule of Chera kings.

Rayiramangalam Keraladheeswarakshethra tops list ,followed by Trikkandiyur .

Then comes Guruvayur and Thriprayar. The Athavanad and kodanad Thrithala has next importance.But ,now only the Guruvayur and Thriprayar have importance and all others have become almost forgotten by people except a few historians.

Religious institutions which were given inam by Govt are given as Trikkavu temple in Pallapram(Pallavapuram)amsam Thriprangod and Trikkandiyur temples under Vettathu Raja and Zamorin after him ,and Guruvayur temple under Thalappalli Raja taken over by Zamorin.

Nine weekly markets where salted fish ,vegetables and other items were sold are listed :-

Day	Place	No:of people attended
Sunday	Thrithala	2000
Monday	Mathilakam	2000
Tuesday,Wednesday	Andathode ,Veliankode	1000
Same	Koottinkal	2500
same	Valanchery near vadakkumpram	1500
Same	Kalpakanchery	1500
Thursday	Chalissery	1500
Saturday	Valappad	1800
Same	Kuttiapuram	1500

Trigonometric station is in Kutnad, Kurunghot hill, one mile south of Trithala in N Lat 10.47'32.64 and Long 76.08'36.50. It is in good condition.

Old tombs called Pandukulis in Ponnani Taluk

Nagalasseri	1
Ozhur	1
Klari	2
Vadakkumbram	18
Mullasseri	3
Annakara	1

(Pandukuli is a group of stones.)

Single stones seen in 13 amsams.

Kappur	1
Kumaranelloor	1
Tavanur	4
Alankode	1
Nagalasseri	10
Triprankode	1
Kanmanam	5
Melmuri	10
Olur	1
Klari	6
Ponmundam	1
Kaaattiparuthy	2
Parutur	1

62 Pandukuli and 44 single stones make 106 such stones. And megalithic kodakkal and stone caves are seen in old Thalappalli Rajavansam areas like cheramangadu etc.

I have given in a nutshell the land tenure, agricultural and environmental features and administrative system in Malabar during Logan's time and before. This will help us understand our own culture and legacy. Since this is not written by any native person, there is no need to say that it is a construct of Savarna or Avarna or any religious communities or agenda of Hindutwa. If there is an agenda, the agenda was that of the British Collector of the time, who wanted to assess the truthful state of affairs before committing to any administrative reforms. There may be a few people who say that he had gone wrong in some of his observations. Even if so, that was due to his unfamiliarity of situation, not due to purposeful twisting of historical facts. And such a commendable historic record on Malabar and Kerala he produced, for us to understand the true nature of affairs at least partially makes Logan immortal in Kerala history.

The Nad or districts of Malabar from 1731-32 to 1805-06

1Kolathunad under Raja of Kolathiri of Chirakkal with Amsams or Taluks :-

Payyannur

Vellur
 Karuvellur
 Korom
 Eramam
 Kuttur
 Kuttiyeri
 Chulali
 Kaniyileri
 Kalliad
 Malapattamkoyyam
 Kurumathur
 Taliparambapattuvam
 Elom
 Cherutalam
 Kunynyimanagalam
 Madayi
 Mattul
 Cherukunnu
 Kannapuram
 Irinava
 Pappinisseri
 Kalliasseri
 Maraya
 Kayaralam
 Kuttyattur
 Maniyur
 Munderi
 Chelari
 Kannadiparamba
 Chirakkal
 Azhikod
 Pulati
 Elavayur

WET LANDS	YR	PATTAM %	CONTEXT
1731-32		20%	K.Raja when Bednur Raja invaded
1765-66		30 %	Hyder invasion.Hyder,Kolathiri,Arakkal
1776-77		50%	Biwi
1777-1780		100%	Hyder Ali
1781-83		50%	Hyder
1785-88		commuted to	Raja (in kind)
			Tipu sultan

1788-89	40%/1000 seers (in Sultani Fanam)	
1790-92	50%(in kind)	People deserted due to Islamisation The Raja
1792-93 survey by Company with Raja		
1798-99	company 50%	Company
1799-1800 50%commuted to 41 ½ /seer (Rs)		Company
1799-1801 .10 seer /potipad(poti=30seer to sow).Usually 10 per poti was for devaswam .This was taken by Govt Velinellu(paddy on hedges)and kaithinellu(for ropes)usual 16 seer for 100 seers. ½ taken by Govt		Company
1801-02 Macleod survey.		
1805-06 All produce of the nad collected and where shortage found extra collected and where increase found ,it was not reduced 50%		Company

Garden land:-

1731-32	20%
1765-66	30%
1776-77	50%
1777-80	100%
1781-83	50%(Pepper was taken in kind)
1790-92	50%(in cash)
1792-99	commutation rate for coconut Rs 10/1000,betelnut 0.6.4/1000,jacks 6/10 of pattam whatever is the number of trees pepper Rs 130.0.0 per Kandy of 640 pounds
1805-06	50% as Janmy pymash as on wetlands and the reduction not made if excess produce.Thus in both gardenlands and grain fields the entire native population suffered right from 1731 to 1805(Logans Manual).

Puttada crops(Like Modam in South Malabar)are highland crops in Elom,Madayi,
Cherutalam Kunyiyimangalam etc .Commutated as Rs 35 /1000 local seer and other areas
as 40 % of gross produce.

Punam crops(rice,pulses,other grains,jungle cotton 30 % of gross produce in named
villages above and 40 5 in rest of the Nad.Commutation rate was 35 /1000 local seer in
cash.

Ellu(Gingily) 20% of gross produce commuted to Rs 40 per 1000 local seers.

2.Randathara (originally under Kolathiri)from where Cheraman Perumal took his final departure .The Amsams in the Taluk of Chirakkal are:

Edakad
Chembilod
Iruveri
Makreri
Anjarakandi
Mavilayi
Mulappilanghad

In 1741 the ruling Achanmaars of 4 families and their Anjoottuvar(500 Nairs)were taken by company under special protection to protect the factory at Tellicherry.The transaction took the form of a mortgage of the Nad for Fanams 60000 ,since it was rich in pepper.In April 1793 on 26th the transaction ended between Achanmar and joint commissioner in allowing the former a deduction in amount of revenue payable by them for their own lands equivalent to the 20% of revenue allowed to other chieftains of Malabar as Malikhana.

WET LANDS		
1765	15 % on paddy in kind	Company
1791	50% of produce commuted to 43 Rs /1000 seers.	
1792-93 Achanmars wet land permanently assessed as 15 %.Commuted to Rs 45/1000seers.Similarly that of Beebi and Chirakkal Raja. Others same as 43 Rs /1000 seers as above.		
GARDEN LANDS		
1765	20 %	Company
1792	50 % of produce as	
Coconut tree	0.1.7	
Betel nut tree	0.0.4	
Jack tree	0.3.2	
Pepper-vine	0.2.0	
1793. Achanmar permanently 20 % as		
Coconuts	10.0.0/nut	
Betel nut	0.8.0/nut	
Jack	0.6.4/tree	
MISCELLANEOUS		
Puttada,Punam ,Ellu: 25 % commuted as Rs 40,Rs 40,Rs 80 /seer respectively.		

3,Telicherry and Dharmapattanam Island as British settlements:-

Amsams originally belonged to the Kottayam Taluk.(portion of ancient Kolathunad) Kolathiri,Kottayam and Cannanore Bibi had claims of trade there .Till 1776 the British factory was there .And when Mysore invasion happened it became a residency,because it was not paying as before.

Dharmadam

Thalassery

Mailanjanmam

Thiruvanghat

Wet lands Till 1772 the rate was only 20 %.In 1776 commuted to Rs 43/1000 seers(as 25 %) in Tellichery, 50 % as Rs 45 /1000 seer in Dharmapattanam,35 % for temples of Dharmapattanam as Rs 45 /1000 seers.The land under company took full 100 % share for company itself.

Garden lands of private persons at 25 % as

Coconuts 0.1.7/fruit tree

Betelnut 0.0.9/fruit tree

Jacks 0.6.4 per fruit tree

Pepper vine 0.3.2 /fruitful vine

In Dharmapattanam all had to pay 50 % of pattam.And puttada and ellu in Dharmapattanam 25 % commuted as Rs 40/and Rs 80/1000 seers

4.Iruvazhinad.(Under Kolathiri).Held by Nambiars of Kunnummal, Chandroth,Kilakkedath,Kampurathu,collectively called Kulatha Nambiars .Kuranghot Nairs possession was part of Iruvazhinad originally .Consists of the Amsams of Kottayam like

Panur

Puttur

Trippangottur

Panniyannur

Perinkulam

Kariyad

Wetlands	Pattam collectors/ rulers
1765-82 50% Rs 40/1000 seer	Hyder Ali ,managed by Chirakkal Raja Tipu Company
Tipus reign same (but in kind)	
1790-91 50 %	
1793 raised to Rs 45/1000 seer on Narangholi Nambiar estate	Company ,managed by Nambiars
1793-94 &95 50 %	
1795-96 60 %	
1799 -1800 72 % (except on Narangholi estate and 4 desams of Panur Amsam)	

Garden lands:- 1765-82 (For Hyder Ali /collected by Chirakkal Raja)

Coconuts 0.1.7/fruit tree

Betelnut	0.0.9/fruit tree
Jacks	0.3.2/fruit tree

Tipu's regime :-

Coconuts	0.2.3
Betelnut	0.0.9
Jacks	0.4.6

This was great burden and whole Nad assessed and people were allowed to fix their own rates.

In 1793 under the company the rate of coconuts and betelnuts same as in 1765-82 .

Jacks :-	0.6.4
Pepper	0.2.18/25

1794-95 The Nambiar's assessment and fixation:-Pepper same .

1796-97 Narangholi Nair estate assessed .(He was involved with rebellion of Pazhassi Raja)and fixed as 100 %

1799-1800 Othe rareas raised to 72 % and Naranghli remained 100 %.

Miscellaneous :-1790-91 Puttada ,punam and ellu 25 %

1792-93 40 5

5.Kuranghot Nair Nad (Between French and English settlements)belonged to Kottayam.

Two amsams

Olavilam and Kallayi.

The Nair lost in battle to English in 1719 and had to cede desam of Mailam in Mailamjanmam.Till 1766 he was a friend to French .Hyder came in that year.He and Raja of Cochin (apart from Achanmar under protectin)were the only chieftains permitted to retain the district.He paid tribute to Hyder.1779 he assisted British in taking Mahe .1782 he was taken prisoner by British when the Tellichery siege ended.till 1785 paid tribute to company.1787 Tipu hanged himand annexed his Nad.1790 company drove Mysoreans and reinstated the Nair family and he turned out to be a French alliance and was arrested and sent as prisoner to Calicut in 1793.1797 reinstated in his nad and he managed it till 1805-06.

Logan says till 1805 how the Nair managed revenue is not known and from that date Mr Rickarts scheme called Janmi Pymaish of 981 ME was done .

6 Kottayam (Cottiot or Kottayath Raja of Puranaattu swaroopam).Logan thinks this is foreign (pura= outside)but it means porai or mountain tracts in Tamil.It is the Lords of Porai or Mountain Kings .It was originally under Kolathiri of which Kottaym is a branch .In 1780-82 & 1791-92 Pazassi Raja supported Tellichery settlements of Company in driving out Hyder and Tipu.In 1792 British cession of Malabar happened.Then Pychy (means the ancient King as well)the Raja turned against Company .He had a sort of independence to flee to Wynad,which was part of his land.In 1799 Seringapatnam fell and Wyanad cession of company happened.This lead to a strong revolt.Till end of 1805 November (on 30th November the Raja died).Kottayam (excmpting Wynad)contained :- Kudali,

Pattannur
Chavassery
Veliyambra
Mulakkunnu
Kannavam
Manathana
Gannavam
Sivapuram
Palassi
Kandamkkunnu
Paduvilayi
Pinarayi
Nittur
Katirur
Kottayam.

In 1805 came under Janmi Pymaish .

7.Kadathanad

(part of Kolathunad formerly.Under thekke Ilankur or southern Yuvaraja/regent of Kolathiri) also called Badagara Vazhunnava (Rulers of Vadakara /Northern land).This means the Southern part of the North Kolathiri (Goladri)ruled by the yuvaraja of the Northern Kolathiri Branch.This branch belonged to the male lineage of Kolathiri. Consisted of Amsa of Kurumporainad (Small hilly land).

Aliyur
Muttungal
Eramala
Karthikapalli
Purameri
Edachery
Iringannur
Tuneri
Vellur
Parakadavu
Chekkiyad
Valayam
Velliyod
Kunnummal
Kavilumpara(belong to Pazhassi)
Kuttiyadi(belong to Pazhassi)
Velam
Cherapuram
Kottappalli
Ayancheri
Kadameri
Kuttiapuram
Kummangod

Ponmeri
Arakkilad
Vadakara
Memunda
Palayad
Putuppanam
Maniyur
Tiruvallur

8,9,10,and 11 were Payyormala ,Payanad,Kurumporanad,and Tamarasseri.

Payyormala Nairs (Paleri,Avinyat,Kutali) ruled the amsa of: Kurumbranaad-
Paleri
Cheruvannur
Mepayur
Perambra
Kaayanna
Karayad
Iringhaat
(Pora as in Perambra stands for small hills and kaat for forests)

Payyanad belonged to ancient Kolam which Zamorin annexed.Has amsa of Kurumbranad
as:-
Kilariyur
Mudadi
Pallikkara
Meladi
Viyyur
Arikkulam
Melur
Chemanchery
Tiruvangur

Kurumbranad proper belonged to Kottayam family. With amsams of kurumporainad
and Calicut:

Kottur
Trikkutiseri
Naduvannur
Kavunthara
Iyyad
Pananghat
Nediyanad
Kilakkot
Madavur

Tamarasseri belonged to Kottayam swaroopam with amsams of Kurumporanad:
Ulleri

Kokkallur
Edakkara
Kunnatahra
Annasseri
Naduvallur
Nanminda
Nediyanad
Kudattayi

12,13 and 14 were Polanad which consisted of Vadakkumporam and Kilakkumporam ,Bey pore or Northern Parappanad,and Pulavaayi.

Porlathiri or Polathalappathy were managing Polanaad under Kolathiri (The other end being protected by Punnathalappathy or Punnathur Raja of Thalappaly)Zamorin took it and made his head quarters at Kozhikoodam.It consists of:-

Elathur
Thalakulathur
Makkadachathamangalam
Kunnamangalam
Thamarasseri
Kuruvattur
Padinjanttum muri
Karannthur
Edakkad
Kacheri
Nagaram
Kasaba
Valayanadkottuli
Chevayur
Mayanad
Kovur
Perumanna
Peruvayal
Iringallur
Olavanna

Bey pore or Northern Parappanad by Parappur family of ancient kings.consisted of
Panniyamkara
Cheruvannur
Bey pore

Pulavayi was under Pulavayi Nayars who had relation to Kurumbranad family and also to Zamorin.They managed amsams in Calicut as:-
Kedavur
Thiruvambadi
Puttur

Nileswaram
Koduvally
Kanniparamba
Chulur
Manasseri
Pannikot

15.Southern Parappanad ,16 Ramnad 17 Cheranad 18 Eranad consists of entire Eranad (under walluvakonathiri first when the Chera ruled).

Southern Parappanad (parappur)had become nominal suzerain under Zamorin.

Their amsa were:-

Palanchannur
Mannur
Thenyippalam
Neduva
Vallikkunnu
Parappanangadi
Nannabra

Ramnad:- consisted of

Nallur
Azhinjilam
Cherukava
Karad
Karumarakkad
Karippur
Chelembra

Cheranad :-

Vadakkumpuram
Valiyakunnu
Kattiparuthi
Aathavanad
Ummathur
Irimbilium(old Ilibhyam)
Parutur
Olakkara
Trikkulam
Koduvayur
Vengara
Kannamangalam
Urakam Melmuri
Puttur
Kottakkal

Indiannur
Valakkulam

Ernad consisted of:-

Mapparam
Chikkod
Urangattiri
Mambat
Nilambur
Kolattur
Nediyirippu
Kilmuri and melmuri
Porur
Vandur
Tiruvali
Trikkalangot
Karakunnu
Arimbra
Valluvambram
Irimbuli
Mancheri
Iruveti
Kavannur
Chengara
Puliyakod
Kulimanna
Payyanad
Elankur
Ponmala

19 Walluvanad proper (Vellathiri) 20 Wlluvanad, 21 Nedunganad 22 Kavalapppara (under walluvanad taluk)

1976-77 Violent and irregular collection of revenue by Mysoreans .9Valluvakonathiri was the title of main branch of Chera /kolathiri who occupied Kudanad as Kudakkon in sangham age and had rights of Perumal and Gangadharakoil adhikari .Entire south Malabar was under his him.North under his 2nd reagent and the southern parts of kerala a svenad under third regent .Zamorin split his territory into Northern kolathunad and Walluvanad by conquering his kingdom. During Mysore conquest he had following

amsa:-

Walluvanad proper:-

Kodur
Kuruva
Pallipuram
Mangada
Arakkuparamba
Chettanallur

Angadipuram
Perinthalmanna
Pulakkattiri
Valambur
Karyavattam
Nenmini
Melattur
Panga
Kolattur
Kuruvambalam
Pulamanthol
Elankulam
Vellattur
Kottpadam
Arakurissi
Thachambara
Anamangad
Paral
Chembraasseri
Pandikkad

Walluvanad under Zamorin:-

Tuvur
Tiruvalamkunnu
Tenkara
Kumaramputtur
Karimpula
Thachanattukara
Aziparamba

Nedunganad (under zamorin) which was originally in walluvanad :-

Elambulasser
Vellinezhi
Srikrishnapuram
Kadampazhipuram
Kalladikod
Vadakkumpuram
Muttadath madambi
Trikkaderi
Chalavara
Cherpulasser
Naduvattam karalman
Kulukkala
Chundampetta
Vilayur
Pulasser

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Naduvattom
Mututala
Perumudiyur
Netirimangalam
Pallipuram
Kalladipatta
Vallapuzha
Kottakurissi
Eledath madamba
Chunanghat
Mulanyur
Perur

Kavalappara under Nair chief (Had alliance with Cochin Raja and Zamorin). This also belongs to walluvanad

Mundakodkurissi
Panamanna
Kunathara
Karakkad
Kulappalli
Mundamukha

Wetland renewal in Walluvanad in 1776-77 (Huzur nikuthi assessed by Mohidin Muppan and Hydros kutty Mooppan) at commutation rates:-

Nads	% of paatam as nikuthivittu (assessed seed)	Commutation rate to money /1000 Macleod seer
Vellathiri (walluvanad proper)	10	125.0.0
Walluvanad	10	125.0.0
Nedunganad . In 89 desams In 9 desams	10	100.0.0 111.1.9 1/3
Kavalappara	10	100.0.0

Arshad Beg Khan reduction to 20 %

Tipu's increase to 12 ½ % for collection charges (these were done to garden lands also)

Garden lands customary pattom converted to assessment in cash:-

Coconuts 7.8.0 /1000 nuts
Betelnuts 0.4.0 /1000 nuts
Jack 0.4.0 /tree

Miscellaneous:-

1976-77:-Ellu as niguthi vithu 30% at old rate of $\frac{1}{2}$ veerarayan panam (2 anna)/local para(10 seer).commuted to $12\frac{1}{2}$ per /1000 Macleod seer.

1796-97 to 1800 -1801 .by Mr Stevens the collector.

1801-02 Major Macleod to 20 % of gross produce commuted as Rs $16.5.2\frac{3}{4}$

1815 modan assessment in some parts consolidated with that of wetlands.1801-02 janma fixed .If assessment exceeded janma no action,and if it is less ,then assessments raised increasing commutation rate to level of the janma demanded for that year.

1801-02 walluvanad and Nedunganad fixed as 20 % .In some parts as Rs $19.0.9\frac{1}{7}$ th
others as $16.5.2\frac{3}{4}$

Kavalappara 1776-78 $\frac{1}{4}$ th of old veerarayan panam as niguthivithu of local para.On wetlands was increased to 4- $4\frac{1}{2}$ panam.commutation rate on wetlands raised from Rs 100 to 106.4.0 per 1000 Macleod seer.On this collection charge extra also levied.1790-01 to 1795-96 revised assessment under company.20 % taken from farmers and remaining 10 % from janmis.On the 20 % of produce a rate fixed as 1 fanam $5\frac{1}{3}$ anna per 2 para (20 seer)or $1\frac{1}{2}$ para (15 seer)per fanam ,or Rs $16.10.8$ /1000 Macleod seer.

Commutation rate of ellu :-

1776-77 to 1789-90	Rs $37\frac{1}{2}$ /1000 Macleod seer
1790-91 to 1795-96	Rs $50-62\frac{1}{2}$
1801-1802	Rs $62\frac{1}{2}$

23 Palghat(Vadamalappuram) 24 Thenmalappuram and 25 naduvattom(All three under Palghat Raja/old Kolathiri /Aranghottu swaroopam)

Walluvanad Raja as sovereign .Palghat Raja is called Kongu Chera and their territory is Kongudesa.

Kaaavalpanam here and at Naduvattom for keeping a defence force against invasions from Mysore .It was only $\frac{1}{4}$ th veerarayan panam /local para 10 seer in a single crop.Then a Rakshabhogan of 12000 veerarayan panam annually from the revenue of the country.

After Hyders conquest Palghat Rajas nephew ruled naduvattom as Hyders regent.

Vadamalappuram:-((Northern districts of Palghat beyond the Vadamala ?

Kongad

Mundur

Kavalpad

Akattethara

Puthusseri

Elappalli

Polpalli

Pallatheri

Puttur

Koppam

Yakkaravadakkumthara

Kodunthirappally

Edathara

Kilakkumpuram

Tadukkasseri

Mattur

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Pallanchahanur
Kannadi
Kinasseri
Thiruvallathur
Palattulli

Thenmalappuram(Southern Palghat beyond Thenmala)
Chulanur
Vadakkethara
Kattusseri
Kavasseri
Tarur
Kannanurpattola
Ayakkad
Mangalam
Vadakkancherry
Chittilancherry

Naduvattom(under Zamorin)
Kottaya(I)
Mangara
Kuttanur
Kulalmanam
Vilayanchathanur
Tenkurissi
Tanisseri
Peruvenba
Koduvayur
Kakkayur
Vilayannur
Manynyalur
Erimayur
Kunisseri
Pallavur
Kudallur
Pallassana
Vadavannur
Kilakkethara
Padinjarethara
Vattekad
Pananghattiri
Muthalamada

1765-66 Ittikombi Achan nephew of Palghat Raja as agent of Hyder increased revenue to one old veerarayan panam per para (10 seer)

1773-74:-Sullayad Khan (Darogha sahib) Diwan,raised to 1 ½ para /10 seer of seedland .Following complaints he reduced it in certain areas as :-when land yield 5 para(50 seer)of paattam for each para(10 seer)of seed sown rate maintained.If less paattam is yielded he maintained the rate but assessed it on proportionately smaller quantity seed eg:-

10 para of seed-land yielding 50 para pattam entered into accounts as 10 para.
.....408
.....306
.....204

Of these 10,8,6,4 para respectively he assessed his rate of 1 ½ panam per para.Thus tehse were factitious measures of assessment quite unconnected with quantity of grain required to sow the land.The rate of assessment was 20 % converted to money Rs 53.9.1 5/7 per 1000 Macleod seer.In some nads it was more heavy.(southern part)In Vadamalappuram modanand ellu assessed at 8 anna per head on all persons payingwet land assessment .This increased also the wet land assessment of that nad.

1781-82 Palghat transferred from Mysore Kutchery of Calicut to Seringapatam.Tipu's increase of 12 ½ % affected the wet lands of these lands.

In Darogha sahib time Ittikombi Achans Parbuthy Menon (accountant)and 2 kolkars (peon)in each desam to collect revenue and for payment of them additional tax of 5 %.Company increased it to 10 %

Garden land under Mysore Govt:-no tax as per custom.

1801-02:-First time tax on garden produce by Macleod.

1 veerarayan panam on 8 productive coconut trees

1 24betelnut trees

14jack trees

¾eachpepervine.

+10 % more for collection charges.

From 62 ¼ % of pattam on fruityielding trees of average 10 nuts /tree at commutation rate 9.6.0 /1000 nuts to, About 67 17/19 % at rate of Rs 8.12.0 /1000 nuts for coconuts – variable. For betel nuts vary from 11 anna per 1000 nuts to 10 anna /1000 nuts at 74 to 81 % rate.

4 anna and 6 pie on each jack tree as 25 % rate.

Modan and ellu was assessed by Mysore only in Thenmalappuram and the assessment was not the produce or rent but at rate of 2 old veerarayan panam (8 anna 0per individual paying wet land revenue.

26 Vettathu nad (Vettathu Raja last was till 24th May 1793) and after that Zamorin

The amsams of Ponnani :-

Pariyapuram

Rayirimangalam

Olur

Kalpakanchery

Melmuri

Anantavur

Kanmanam

Ponmundam

Tanalur

Niramaruthur
Talakkad
Vettam
Pachattiri
Mangalam
Trikkandiyur
Iringavur
Klari
Chennara
Tripranghod
Pallipuram
Purattur

1777 Ramalingapillai ,agent of Hyder for introducing Huzur nikuthy assessed whole taluk .

1 local para (io seer)of nikuthivithu for every para of paattam (25%).To it a tax of 3 old veerarayan panam (75 Rs /1000 Macleod seer)

Mr Graeme assessed:- paattam varied in different desams as nikuthy vithu .

In 65 desams 25 %

38 desam 22 ½

8 desam 20 %

7 desam 16 ½ % at the uniform rate of Rs 75/1000 Macleod seers.

1782-83 Arshad Beg Khan severity increased.Two of his subordinates (Venkappa and Venkaji)levied additional collection charge of 15 %.Tipu's increase to 12 ½ % affected the entire nad.

1790-91 to 1793-94. full revenue at this rate was collected and only very little balance remained in 1800-01.

1801-03 Macleods survey .An increased revenue resulted in a rebellion.Mr Rickarts reverted to old settlement in 1802-03.

1803-04 Mr Warden increased 1/4th of the assessment fixed by Macleod but it did not affect the principles of the settlement in force.To this was superceded 15% charge of collection.

Garden lands Revenue introduced in 1777-78 Ramalingapillai – about 20 %

Coconut Rs 7.8.0/1000 nuts

Betelnuts Rs 0.4.0

Jacks 0.4.0/tree

Tipus 12 ½ % applied to garden lands also.

1790-94 Full assessment of this rate was completely revived

1801-02 Macleod increased rate as on wetlands and same reforms of Rickarts and Warden followed. Establishment charge was 15 % .

Modans –MCLEOD in 62 desams 20 % of gross produce as paattam was taken .Of this 25 % (to say 5%of gross produce) taken as assessment and commuted at rate of Rs 85.11.5 1/7 /1000 Macleod seers

In 7 desams every para of seed sown assessed at 1 new veerarayanpanam .Assuming the outturn to be fiveold the assessment would be 20 % of gross produce valued at Rs 28.9.1 5/7 /1000 Macleod seer

In 62 desam crop further assessed at 15 % for collection charges and in 10 desams as 10 %.

After 1801-02 Mysore principles continued as 20 % of gross produce at current market rate.

Ellu is not much cultivated and hence not assessed.

27 Kutanad and 28 chawkad and Chetwai.(Zamorin except on island of Chetwai island in Taluk of Ponaani)

Limits of Chetwai island(under Dutch from 1717 ,in 1776 by Hyder Ali.In 1790 to the company)

Vadanappalli

Nattika

Pallipuram

Edathiruthy

Kaipamangalam

Pappinivattom

Pananghat

Kudanad and Chowghat and Chetwa in Ponani Taluk.

Kudanad (under zamorin)

Tavanur

Kaaladi

Kodanad

Melattur

Chekkod

Anakkara

Kilmuri

Pottanur

Iswaramangalam

Pallapuram

Ponnani

Kanyyiramukku

Edappal

Vattamkulam

Kumaranallur

Kotachira

Nagalasseri

Thirumittakod

Otalur

Kapppur

Alanghod

Pallikkara

Eramangalam

Vayilathur

1767-68 till 1773 again under zamorin.

They returned again in 1777-78 and started collecting Huzzur nikuthy upon an actual reaping and measuring of the crop, taking 2/3rds of gross produce as Govt share on rice lands and leaving 1/3rd to cultivator. The people fled and lands lay uncultivated. Then came Ramalingapillay under orders of Hyder Ali and made survey but the amount collected fell short of Huzzur nikuthy

He ascertained the Landlords rent as Mudalalintra paattam (headmans rent)as follows:-

In 24 desams 60 % Rs 25.0.0/1000''''''''''''''''''''

1781-82 British possession for a short time .They restored the old Raja to manage it .Arshad Beg Khans and Tipus 12 /2 % affected wetlands.

1785-86 Krishna Achari appointed by Arshad Beg Khan to manage .He added 2/16 of an old veerarayan panam or 12 ½ % to the jama(demand)under designation Hetcha nighuthy.

1790-91 Company allowed the Rajas to maintain the Nad .Chetwai island made over to management of Raja of Cochin who managed it till 1801 with a short interruption .He paid a revenue of Rs 40000 /annnum to company.

1791-92 3/4th and 1792-93 6/10th of old jama was collected in the Nads except Chetwai island.

1793 -94 company's servants and Raja together collected full jama on all cultivated lands and added another 10 % for charge of collection.This continued till 1799-1800.

1800-01 Mr Drummond ,subcollector increased by adding an assessment on the uncultivated lands.

1801-02 Jama regulated by Major Macleod survey .Rickarts reverted to that of 1800-01.In some places Macleods collection remained.

Garden lands:-

Huzur nikuthy principles applied.100 % of pattam taken at customary rates usual between janmi and ryots which rates were as usual in South Malabar.

Coconuts Rs 7.8.0/1000 nuts

Betelnuts 0.4.0/.1000 nuts

Jacks 0.4.0/tree

Considerably below market price.

Arshad khan 20 % reduction

Mysore and the company imposed 10 %(20 % in all) as colletion charge

Hecha nikuthy of Krishna Achari or a further addition of 12 ½ imposed on gardens

Macleods increase in 1801-02 was not removed

No assessment on Modan aand ellu the cultivation being inconsiderable.

Retrospective summary and method adopted for working out:-Following Major Macleods illadvised innovations in 1803 ,Mr Rickarts to remedy inequalities of assessment and to fix principles of new assessment had a meeting of chief janmis convened in Calicut and consulting their opinion recommended a scheme in July 1st 1803 .This proclamation published on 21st July 1805 is given in Volume 2 of Mlabar Manual as appendix No XV.Malabar Rajas,Head Nambuthiris and Mukhyasthans were made tounderstand that a unified system has to be worked out .The general points agreed upon were :

1 On wetlands of rice fields ,deduce from gross produce the seed and exactly the same quantity for expenses of cultivation .And then alott 1/3rd of what remains as kollulabham (Plough profit) for the Kudian who does agriculture.The residue of paattam is divided in a proportion of 6/10 to the Govt and 4/10 to Janmakkar.

2Parambu or orchard land :- $\frac{1}{3}$ rd of coconut, betelnut and jacktree produce is sufficient for the Kudian and the remainder or paattam can be equally divided between Govt and Janmakkar.

3.Dry grain land (which is scantily cultivated in Malabar) Govt can take $\frac{1}{2}$ of the Janamkkar varam on what is actually cultivated during the year. The assessment of pepper produce was to be assessed later. This proclamation was signed in 1805 by T.Warden, the principal collector.

Illustration:- Suppose quantity of seed sown is 5 para and the outturn multiple is with 15 the gross produce will be 75 para.

From this 5 para for seed, and 5 para for maintenance of the kudian is given. Thus remaining is 65 para. From this $\frac{1}{3}$ rd is as the profit of cultivator again given to Kudian which is $21\frac{2}{3}$. The remaining is $43\frac{1}{3}$ as paattam. Of this 60 % taken by British Govt (26 para.) and janmakkar or landlords get 40 % of $43\frac{1}{3}$ para or $17\frac{1}{3}$ para.

Commute what each gets (Page 665 vol 2 Logan) for wet lands of paddy:-

Seed	5 para
Expense of cultivation for kudian	5 para
Kudians profit	$21\frac{2}{3}$ para
British Govts paattam	26 para
Janmakkaran (Land Lord paattam)	$17\frac{1}{3}$ para.

The lowest is for the janmakkarar. So there had been no foul play from the Landlords who had signed the agreement with the British. And Kudians were not the sufferers.

Garden lands :-

Coconuts and arecanuts areas had paattam divided as two halves and both Govt and landlord got equal share and Govt share was commuted to money value

Gross produce	100 nuts
Cultivators share $\frac{1}{3}$ rd	$33\frac{1}{2}$
Remainder, is share as paattam	$66\frac{1}{2}$
50 % to Govt	$33\frac{1}{3}$
50 % to Janmi/landlord	$33\frac{1}{3}$ rd
So all the three get equal share of $33\frac{1}{2}$ and $33\frac{1}{3}$ rd.	

Jack tree:- same principle adopted as 50 % paattam to Govt and Janmi. The standard share of British Govt when commuted to money was 60 % for both wetland and garden land. This method of calculation was called the Vilachal Meni paattam.

The $\frac{2}{3}$ rd produce in wetlands was ascertained in a certain manner. For coconut and arecanut, the $\frac{2}{3}$ rd of the produce was in nuts only.

How this is different from two other paattams of the land? (Verum paattam and Nikuthi paattam)

Verumpattam:- The actual rent from Ryots for janmis. What was its ratio to gross and net produce? The British collectors thought the janmis were giving false accounts of the

paattam. Mr Graemes proposals and the Govt policies to fix it lead to collisions and rebellions like Mapilla fanatical outrages and other evils (Logan vol 1 .page 667). The rent paid by intermediaries, and rent paid through intermediaries by sub-tenants were not distinguished by the reformers. Ryots directly to janmi, intermediary kaanakkar to janmi were there.

On wet lands verumpattam varied from 10 % of average available gross produce. (in places where accidents and los are likely to happen) to 33 or 45 and as high as 50 % when the settlement with tenant is only for one year. The word available meant customary 20 % of gross produce for the sake of expenses for reaping, threshing, winnowing , fee for carpenters , smiths, other professional who make instruments, and for janmam rights of the janmi. This reduction of 20 % did not come into Mr Graemes calculations .

For garden lands verumpattam was balance of produce in nuts after deducting for cultivators share of 20 % .in North Malabar and 33 ½ in south Mlabar. The real share in money was Rs 20 and Rs 25 on 10000 nuts. The husk, from which coir is made, leaves for thatching, branches, wood etc were cultivators share of profit. (labham) and excluded from any estimate of produce in fixing verumpaattam.

Jack trees was estimated of its money value of produce. Money value depends upon a market nearby . The money value is judged roughly by inspection. Many trees had a value of 1 ppanam of paattam. In some places een less. Thereofre verumpattam is only 1/3rd of gross produce.

Nikuthi paattam (Mysorean tax)

Mr Graeme found that the records of Mysoreans mention nikuthy vithu but do not mention the proportion of it to gross or net produce. He gathered information from inhabitants of Calicut Nad and from south Malabar nads and then its proportion in Srirangapaataanm records. The people said that the tax thus collected was not sent by Sirdar Khan to Srirangapatanam. The verumpattam was either concealed or understated by the Mysorean officers owing to favour, intrigue or local causes. This pattam extended to only Nads where there was Huzur Nikuthy and in them to both wet and garden lands. It represented no fixed share of the produce in kind, but the share in kind ,commuted to money at fixed rates.

Then in 1805 the tax regulation of British was like this:-

Nad 1,5, and 6 partly vilachal meni paattam and partly verum paattam both on wet and garden lands.

Nad 2,3,4,7, of garden lands and wetlands and Nad 23,24,25,27 & 28, on wetlands
Verumpaattam

Nad 8-22 nd 26 on both wet land and garden land and in Nad 27,28 on garden lands
Nighuthi paattam.

23,24,25 Nads garden land assessment was taken as shares of vilahal meni paattam for comparison.

This was the comparative assessment made in 1805 by British administration. On this principle a detailed table was prepared and this is given in Logans Manual which serves as a basic for the British India reforms, Mysore reforms and the actual custom of the land before these foreign regimes.

The British thought that the tax on North Malabar in Misellaneous land wa more than the Souh Malabar (they didn't realize the fact that the South Mlabar is the place where rice in

KOI wetlands is more and miscellaneous grains are not there much I South Malabar and hence the disparity). But they also noticed though heavier than South Malabar the tax was less oppressive to North Malabar inhabitants individually. (The cost of cultivation as well as net and gross produce of paddy is more in South Kol lands and hence when even a slightest tax increase is made it becomes oppressive to kol field cultivators).

Position of the Ryot or the actual cultivator in Malabar as in Logans Manual:-

The Malabar Ryotwari was different from what Sir Thomas Munroe understood. His definition was as follows:- Labourer, farmer and landlord were united in the ryot. Ryot could not have subtenants as long as Govt wastelands of good quality existed for any one to cultivate. The laws of inheritance in force in eastern districts have constant tendency to break up property and cause subdivision of landed estates (which is detrimental to co-operative ricefarming).

In Malabar it was not a ryotwari of this type.

1. Suppose there is no wasteland in convenient reach, and all land is cultivated

2. Suppose the waste land exist in convenient reach but is property of a private person and not of state

3. Suppose laws of inheritance directly tended to keep property together

4. The class of labourer, farmer, landlord were distinct and separate by their professional functions.

It cannot be a Ryotwari of Sir Thomas Munroe's definition. Malabar thus was not a ryotwari of that type.

Looking at it from another point of view the issue of whether the Zamindar or the farmer should pay the Government tax to British / Mysorean Govt.

Then how did it become a ryotwari? Logan writes that under the terror of Hyder Ali and his son Tipu Sultan who prevented the Brahmin, and Nair landlords (whom they never trusted) to collect tax and entrusting it to Mohammedans cutcheris of new sovereigns.

The new lands cultivated (wastelands converted to cultivated fields), the farmers soon become proprietors and drop character of labourer and farmer and become landlords. Thus Thomas Munroe's ryotwari was not a permanent one. A state of affairs was brought about in them after some time just as that existed in Malabar from the very first.

Private property in land existed already in Canara and Malabar (which were part of one land, Kerala under Kolathiri Valluvakonathiri/Chera king). After Dec 16th 1818, British introduced an intermediate class (Zamindar/Moottahdars) between crown and janmakkars. By 5th January 1818 the existing system of revenue was abolished and Ryotwari introduced by a board of revenue.

They gave instructions to British collectors that the new system wanted to restore landed property, convert all bad farms of the Tamil country to good estates, and landholders to landlords. The only districts classes as ryotwari were Malabar, Canara, Coimbatore, Madura and Dindigul. (Except Madura and Dindigul all belong to old Chera country). All others were managed by zamindars and under village lease systems.

The board of revenue defined "That particular class only among them (the cultivators of the soil) who employ, superintend and sometimes assist the labourer, and who are everywhere the farmers of the country, the creators and payers of land revenue." They also defined rights of ryots in Malabar and mistakenly treated the rights of janmi,

kanakkar and paaattakar as equivalent to the ryot .many of the janmi,kaanakkar and some paattakar had no title as cultivators or farmers,or creators or payers of land revenue.The board took the three class as proprietors,mortgages and tenants .There existed in Mlabar other classes besides the ryots (landlords entitled to rent from under tenants, intermediaries liable to pay rent to landlords ,to receive rent from under tenants,etc).The board classified the ryot as the actual cultivator of soil,as proprietor,farmer or labourer. he by his industry and skill pay the Govt revenue and contributes to general welfare of state.All others having interests in the land were mere investors of their money.The mistake made in 1818 (in Malabar)was to drop the actual cultivator out of sight and to substitute for him an ideal ryot.

12th December Board of directors reviewing a letter from Board of revenue declared that the ancient systems in Malabar is extremely defective.They said that the accounts of Mlabar Rajas were different from other parts of India ,and should be received with caution and distrust.The rights in Mlabar and rest of India is so different regarding property rights ,they found.(The land as property f God,of temples,and to king as a protector still prevailed there but in rest of Idia it was not so).They declared on principle of a unified civil code” that Malabar was in no way singular to rest of India “and they wanted to make it like rest of India and they succeeded in this.Thus what existed in North India ,as a result of repeated attacks from outsiders,and due to changes by repeated sociopolitical changes under threat of invasions and political upheavals came into existence in Malabar ,suddenly without any need (since there was no attack) with British rule.What the Afghan and Mughal and other attacks had done to North India was done to Mlabar by British without any attack or killing ,by rulemaking .(What the condition of the lowlying wetlands and its cultivation problems and how they are different from rest of India was unknown to them).After Thomas Munroes repot on such inequalities in Mlabar,on 4th July 1817,The Govt with Thomas Munroe at its head reported that they are dissatisfied with the peculiar conditions in Mlabar .The collector had reported that there 150,000 occupants in Mlabar (including morgagees) and they assumed more than that may be involved in actual cultivation .And all revenue and information they obtained was of the Rajas and landlords and they suspected some foulplay .They wanted to know whether these 150000 occupants are cultivating the lands immeadiatetly by slaves,hired servants,or are there a class of inferior tenants to whom they sublet a portion of lands etc.On 24th August 1822 ,Collector Vaughan reported which is very important.He said ,there is no need for interfering the protection of undertenants etc ,since people of all castes and religion engaged in agriculture exactly as they felt inclined,and slaves too were under protection of the law in Malabar.But the board of Directors depended upon Mr Graemes report and on 18th May 1825 took measures accordingly.

They reported:-The intermediate class of People in Malabar is enjoying a part of rent which should come to Govt .Such people who subsist on land without cultivating t are numerous in Malabar.

Their anxiety was regarding the artisans and other military class,seafaring class etc who also get a share of the food cultivated by the community as a whole .The service class were part of society,including the office bearers like kanakar,astrologer /materiologist/ assessor of crops etc and all were getting shares .When British collectors,accountants, other officials replaced them ,giving a share of food (which should come to British

Govt) became a nuisance to Government. Thus the entire traditional system of co-operative farming best suited for Kol puncha wetlands of South Malabar was first destroyed by the individual property rights, and landlord system under Government control. We still follow it, but under our own Government.

Subsequent land revenue history:-

21st July 1805 Mr Warden sends notice to all proprietors of land to get details of landed property:

1. To obtain name of every field in the country for serving as a ground for actual survey
2. To get accurate numerical account of every assessable tree, to regulate garden assessments. The statements thus obtained are known as Janmi Pymash of 981 ME (1805-06).
3. Arranged subcollectors to classify soil in every Taluk to ascertain actual produce.
4. Laborious task of surveying wetlands. The surveyors were all outsiders and entered duty in year 1806. They completed task with four years.

The accounts thus produced is known as Alavu Pymash 1806-10. (Hinduvi Pymash as it is written by a Maharashtrian). Considered to be the best reliable accounts.

Proclamation of July 21st 1805 mentioned earlier was after this report.

Till that time revenue arrears never occurred in Malabar and people were all satisfied. But suddenly people, including landowners could not pay rent, and landlords could not help them in need and every one thought the assessment oppressive. In 1817 when Thomas Monroe visited he heard the grievances (though the assessments were very moderate). The balance of revenue realized was small, but people affected were large by the moderate assessment of the new Government.

10th Feb 1818, Mr Graeme, a judge appointed to introduce a new system of police and magistracy and to produce improvements on revenue administration.

14th January 1822 he completes his work. His proposals:-

The most important is that on wetlands the 60% agreed upon as by proclamation of 1805 was on vilachal meni paattam and this was abolished and instead 65% of actual rent (as verumpaattam) is the company's share. Mr Graeme's proposal approved by Munroe (16th July 1822) because they thought the company has a rightful share of 65% and even then there is a balance of Rs 1,39,922 to be given to the Company which the people should pay. (That is a 13% reduction of what they actually should get is still not paid by people and the people were considered in debt.)

In garden lands 50% of paattam was fixed. But Mr Rickharts had reported that people (janmis) of North Malabar enjoy 80% produce of nuts from coconut, arecanut and 80% of money paattam from jacks but in South Malabar only 66 2/3% of the same. Mr Rickharts had followed the South Malabar distribution because entire North Malabar at that time (except the Chulali Nambiar) was in revolt against the British due to the reforms. Mr Graeme said the North Malabar plan to be followed in North and South Malabar plan in south. Thus the plan was worked out as follows:-

1. The janmi pymash accounts the total number of trees that existed in 1805
2. Deduct all trees that are unproductive, or too young to bear fruit

3. A further deduction (at 20%) for trees at that time productive, but had gone out of bearing since.
4. The number of young trees (75%) had come into bearing within that period.
5. Thus arrived at actually reproducing trees.
6. Also number of unproductive trees
7. From number of unproductive trees deducted the number (20%) which he thought might be cut down or removed when his rates per tree came to be applied for all productive trees.
8. Thus arrived at number of unproductive trees to be dealt with when the assessment came to be made.
9. Added the number of unproductive trees thus arrived at to number of productive trees and found the total number of full grown trees at the time of the assessment.
10. Then applied his rates of gross produce in nuts per tree ascertained from Janmi pymash accounts of 1805-6 to number of productive trees present and obtained the gross produce in nuts.
11. To this gross produce of nuts applied his locally ascertained prices of produce and money value of gross produce of those trees.
12. Applying money value of the gross produce the principles mentioned above for North and South Malabar, he made a customary pattam rent for arecanut and coconut gardens.
13. Applied the money pattam rates obtained from Janmi pymash accounts to number of productive jack trees.
14. He found that what the Govt share at 50% of the customary pattern was on all trees.
15. Then he divided the Govt share of customary pattam which he expected to find standing at time of assessment. His rate for trees he decided to apply for all standing trees except those which were too young to bear fruits. These rates he proposed should not be altered for 12 years. Thus Mr Graeme said the collected revenue falls short by 7% of what is the actual revenue.

Miscellaneous Modam lands:- Greame proposed the same rate as existed (20%) for South Malabar. Sir Thomas Munroe accepted except the clause for cutting down old fruitbearing trees. Mr Graeme came again to Malabar to revise the revenue establishment, to revise garden assessment, and to revise wet land assessment. He did not complete his work and left in May 20th 1823 leaving the job to Mr Vaughan. He was given a sketch of his plans to be followed. These plan of operations Vaughan was to carry out.

What were the plans of operations of Graeme?

1. Obtain from people themselves the number of trees in each garden and produce of the same
2. Inspect them and correct if people have given false reports
3. When satisfied with correctness of tax returns, calculate resulting produce in gross. Take 1/3rd as Govt share in South Malabar. This share to be commuted to money at fixed market rates of produce which he had ascertained himself.
4. Arrive at total assessment to be imposed on each village.
5. Communicate to people the gross assessment thus fixed, allow them to distribute it over all trees in all gardens of village, which were divided for this purpose into Aaattu veppu (riverside, low-lying, damp, fruitful gardens) which were of 2 subtypes and Karaveppu (on highlying, less productive locality) which were of 3 classes.

6.His aim was to obtain a fixed rate of each tree depending upon its locality 9either aattuveppu or karaveppu).

7.If rates of assessment fell short of total assessment made,deficiency was made good byincreaing rates first in AAttuveppu trees and then on karaveppu.9the rate raised on trees in the best class gardens).If such a fixed rate is put on each tree of village,there is no need further to calculate gross produce of individual gardens which was difficult .

8 Aaattuveppu and karaveppu rates differ.Karaveppu need more care ,more expenditure. And give small produce than lowlying areas.But both his classification and his assessment were incorrect in many places ,Logan points out(page 689)

1824-25 Mr Vaughans survey was completed and put in operation.It was hasily done and dissatisfactions arose.It rapidly increased.On 28th February 1826,Mr Sheffield took charge of the district and in March went to Thalachery,organized survey of 5 amsams(village)of Kottayam Taluk,whose people were the first to raise in revolt.Then he took up 21 villages in Kadathanad,the whole of Kurumbranad,22 descending villages of Calicut Taluk,70 gardens in PuluvaayiNaad,one amsam in Ernad,2 in Nedunganad increasing or decreasing the assessment he though necessary in each place. In 1827-28 the operations were put in practice in Kurumbranad ,in Calicut in 1828-29,Kadathanad and Kottayanm in 1829-30.

Lands along Mahe river and Dharmapattanam island were still too high,for the clamour of the people had not ceased there and revenue was collected with much difficulty.From 1829-30 to 1840-41 survey continued and anincrease of revenue of Rs 18,849 instead of the 7 % deficiency was imposed as extra for deficit revenue which Mr Graeme anticipated.The actual amount thus collected at a small rate was Rs 2,79,896 which was too high for people but which Govt thought only a small increase.

The revision of 12 years was there in the scheme.In 1843-44 Mr Conolly pointed out that no fixed periods of revision can be named .In 1850-52 there were general complaints of overassessment and entire Kurumbranad Taluk was resurveyed.Only a decrease of Rs 366 was allowed.1854 Conolly said there are losses to Govt and resurvey ids needed.In 1858 Mr Grant said the loss was due to misfortunes and the favourable seasons have made it balanced and no resurvey needed.

Wet lands assessment schemes:-

The assessment of wetlands did not progress o fast.Mr Robinsons letter to Board of Revenue 5th August 1857 :- Said that there is a plague spot in survey of wet rice lands .He suspected the proprietors were not trustworthy.The Desam adhikaris are backward in survey of ricefields and do not pay attention to orders.They are lukewarm to the cause.Their accounts are false and beyond description.They conceal deed,and makes it impossible to ascertain the resources of this country.In letter dt 3rd June Mr Vaughan speaks of his utter despair of being able to prepare any returns within reasonable time and hopelessness of getting any true deeds done through desaadhikaaris.Ryots also are defeating every cause .The country teemed with fictitious deeds ,he wrote.He thought all of themwere making profits defeating the British Governement (It is surprising with all their justice ,they could not see that it was they who were doing that at the expenseof those poor people and their protectors the traditional systems etc).

Special and singular provisions and rewards were proclaimed for true informants and penalties for frauds.Forfeiture of concealed land was threatened.If fraud is found

assessment of full amount rent was extracted. What did these collusions do on morals of people? On 12th October 1824 Mr Vaughan notes, that this led to an enormous number of feuds and disputes (vyavahara) among the people and suits beyond calculation in civil courts. Thus the first seeds of disbelief and quarrels were sown among the peaceful people who were good farmers and had a good system of revenue and barter for self sustenance and extra income from trade and commerce. 9TH June 1825 he reported that there is total failure from local people to fulfil promises made by them that true accounts and correct returns will be paid and scheme of Mr Graeme has failed after two years of its operation. Another 5-6 years continued with this effort and the Utopian dream died by its own corruption but Indian people had lost their habit of respecting each other and their dharma and had become mercenaries and breakers of their longlasting co-operative agroeconomical farming societies.

Wet land survey was postponed till garden survey ended. Meanwhile price of produce rose, and revenue came easily and the need of survey did not crop up because of enough money for Government. In 1832-33 Govt felt necessity of revenue accounts. Holdings and changed sizes and principles of assessments changed. The good land was assessed at low rate and bad land at higher rate. To remedy the inequities a plan called Pukil Vivaram accounts was prepared. The heads of villages had to be entrusted with this account preparation again. In August 1857 Robinson called it the Desadhikary Pymash with no guarantee for accuracy or fidelity (To Govt). In 1843 when an attempt was made to read them (Kulavar chitta or Individual account) they had been declared worthless. Mr Conolly at once stopped spending money on it. Mr Robinson expressed his views about pukil vaaram accounts that they were not worth examining. He suggested an only solution for the confusion to take as base the 1806-10 Alavu Paattam (pymash) on wetlands as it existed in 1800-01 and was slightly modified in North Malabar only with the janmi pymash 981 ME 1805-06. Robinson's proposal was related to wetlands exclusively (Board proceedings 1863 November 12th).

A uniform rate of assessment /acre on area cultivated annually of 12 Anna was fixed in 1861 November. Rate per 1000 Maleod seers the commuted amount in money in 1861 in the 8 Taluks were as follows:-

TALUK	RICE (Rs .Anna.Pai)	ELLU (Rs .Anna.Pai)
Chirakkal	21.14.5 22.2.9	62.12.9 73.3.8
Kottayam	24.7.3	78.7.4
Kurumbranad	25.14.3 24.12.8	75.0.0 60.9.0
Kozhikod	20.8.8	76.6.11
Eranad	15.10.9 19.14.8	52.11.8 51.1.2
Walluvanad	12.4.3 14.2.2	52.0.0 49.13.4
Palakkad	14.3.6 14.10.0	55.8.10 48.14.4
Ponnani	14.12.5 15.3.10 20.13.4	74.1.2 57.13.7 50.10.9

Assuming Govt shares as 1/5th of gross produce ,per acre they got a commutation rate of Rs 17.11.11 per 1000 Macleod seer (for paddy) and Rs 63.15.8 for Ellu .From 1805-1861 no revision was made on Punam krishi lands.

How Mr Sheffield in 1827-28 made assessments on Modal lands:-

1. Classified all lands into three qualities according to productive powers

1st class yield outturn multiple of from 6 18/64 to 4 43/64 the quantity of seed sown.

2nd class yielding from 4 26/64 to 3 16/64

3rd class yielding 3 15/64 to 2 9/64

2. For each class a fair and moderate quantity of seed was assumed as necessary for 100 square kols (chathurasra kol) of land

3. Land was then measured and its square contents found

4. The square kols X quantity of seed X outturn multiple = Gross produce

5 Government share = 1/5th or 20 % of gross produce.

6. This was commuted into money assessment of rates fixed for each Taluk with reference to average local prices.

When he tried to do this extensive abandonment of cultivation happened in Ernad Taluk and he himself had to admit that his rates of commutation were exorbitant and arbitrary and had to abandon it.

For Punam, when money rates per acre vary from 8 anna to 12 anna were imposed in 1861 , it was :-

10 Anna in old Kavayi Taluk of Chirakkal

Same in Kottayam Taluk

12 Anna in old Kadathanad Taluk (Northern part of kurumbranad)

8 anna elsewhere.

The acreage rates were as follows when the revised Govt order was passed in them:-

Rs 3/acre kavayi (chirakkal)

Rs 3/acre Kottayam

Rs 4/acre old kadathanad

Rs 1 or 12 Anna elsewhere.

The ancient customs were all abandoned and the assessment in 1861 was in greatest confusion. Assuming Govt share as 1/5th of gross produce money rates per acre represent commutative rates of Rs 8 to 12 per 1000 Macleod seers.

What were the other miscellaneous seeds cultivated in Malabar ?

Revenue board proceedings dt 24th Feb 1870 gives the following in Palakkat Taluk:-

Cholam, Raggy, Chaama, karimbu, horsegram, pulses, tobacco, thomara, amarakay, castor oil seed, and these were assessed as 12 Anna per acre in 1870. A similar proposal to other crops like pepper, ginger etc was later abandoned on 16th September 1873. (Revenue board proceedings).

Earlier in 1861 Govt had fixed a rate of 6 anna per acre for such miscellaneous krishi and 16000 acres were identified with such cultivation. On 2nd September 1862 Ballard issued orders to assess permanently on acreage such lands which came under palliyaal and vilanokki charthunna vaka.

These were specific local lands.

Palliyaal:-Ricefields intermediate between ordinary lowlying paddy fields and the high lying Modan lands. (The lowlying lands were managed by co-operative farming. High lands individually. Palliyal in between had both under the temple/royal authorities)

Vilanokki charthunna vaka:-lands similar to palliyal and inspected annually for assessment. Palliyal was formerly assessed as Modan land at 1/5th of gross produce. Vilanokki charthunna vaka was assessed like a fresh paddy field.

Some naads were treated as exceptional. They were Cannanore and Laccadives, Wynad, Cochin, Thangassery and Anjengo.

Aliraja had only a small portion on mainland of Cannanore about 31 desams in and about the town and cantonment and Taluk of Chirakkal. They had to pay a lump assessment of Rs 3801 for the mainland territory. The Laccadive territory belonging to his family were Agathy, Kavarathy, Androth, Kalpeni, and Minicoy. There were a few uninhabited islands as well. Original assessment was Rs 11200 but reduced to Rs 5250 due to some misunderstanding during 1796 Karaar between Bibi and its rightful suzerain the Kolathiri Raja. The islands except Minicoy had broken loose from Ali Raja in period 1874-75 and exported their produce directly without any restriction and the following was their quantity of produce of which coir yarn alone is monopolized.

Coir yarn 6355 cwts	Rs 62631
Coconuts 1534121	23011
Copr 1783 cwts	16200
Jaggery 5930 cwts	27423
Vendhia, a sweetmeat 2693 bundle, 13 cwts	1334

Total 1,30599

Besides the four islands yielded annually on an average of ten years some monopolized products:-

Cowries 71 cwts	Rs 859
Tortoise shell 34 lbs	192
Total	1051

The monopoly produce value of the 4 islands was Rs 63682.

In Minicoy no monopoly of coir yarn, cowrie or tortoise shell. The revenue from this island was:-

Coconut from Pandaram (king) land 550000 numbers

Coir yarn (poll tax) 22 Candies

Sugar (poll tax) 90 adubah worth Rs 225 in Malabar

Rice (tax on large trading vessels from Bengal) 20 candies

Mas fish (tax on fishing boat) 350 fish

Money rent Rs 900

The money value (at price rates in Malabar) Rs 7000 / annum / gross

The net revenue after charges of collection Rs 9750.0.11 on the 5 islands and on territory at Cannanore.

Wynad and Nilgiri Commission:-

Wynad Consists of

Peria

Edavaka

Nallurnad

Ellurnad

Kuppathod

Putati

Kurumbala

Porunнанur

Tondarnad

Vaitri

Etannatassakur

Muppainad

Ganapathivattom

Nilgiri commission consists of :-

Cherangod

Munnanad

Nambolakkotta

Constant disturbances existed and agitations were there till death of Keralavarma Pazassiraja (Pychi Raja for Logan) on 30th November 1805. Mr Baber on 1st March 1806, (after the Raja's death) reported that the paattam was double the quantity of seed sown. Then Mr Warden sanctioned the following scheme :-

1. Ascertain number of poti (30 seer) of seed sown on each holding
2. Adopt as fixed outturn multiples of the seed sown in lands in the following amsams in the following figures.

TALUK	OUTTURN MULTIPLE
Wynad Taluk	
Amsam:	
1 Peria	13
2. Edavaka	13
3. Nallurnad	11
4. Ellurnad	11
5. Kuppathod	15
6 Putati	15
7 Kurumpaala	13
8 Porunнанur	13
9 Tondarnad	13
10 Vaithiri	13
11. Etanaatassakur (Edanaattachan koor)	13

12.Muppainad	9
13 Ganapathy vattom	9
Nilgiri commission	
1Cherangod	9
2.Munnanad	9
3.Nambolakkotta	9

3.The number of Potis(30 seer)of seed X respective outturn multiples =gross produce of holding

4.Deduct from gross produce ,for expenses of cultivation 3 potis(90 seer)for each poti (30 seer)of seed sown.

5.Divide balance thus obtained of the gross produce in equal shares between the Gocernemnt,the Jnamiand the Ryot.

6.Commute the Governemnt share of net produce into money at rates varying according to local market price.This was leftto Mr Barbers discretion.Mr Baber used his discretion power excessively according to Logan ,like the Mysorean officials had done earlier .Later on Mr Warden resolved itself into a simpler scheme of money rates assessed directly on the poti of seed.(not on gross produce but on poti of seed sown itself).This saved work and bother.Instead of applying uniform Govt share ,uniform money commutation rate,of uniform net produce ,the uniform resulting money rate could be applied directly to quantity of seed required to sow each holding and was followed in areas in which uniform conditions hold good.Eg a land holding 5 poti of grain in Ganapathivattom amsam :

5 poti X outturn multiple 9=Gross produce 45

Gross-expense of cultivation (5X 3) =45-15=30 is net produce

Govt share =30/3=10 poti

At Rs 1.2.9 ½ per poti=Rs 1.11.11

5 potis (the seed) at Rs 2.5.7 =11.11.11.

Thus applying the rate Rs 2.5.7 to number of potis of seed sown all intermediate calculations saved.Only annual assessment of quantity of seed needed (that is vilachil meni paattam method was learned by the British).Mr Graeme did not want to interfere with wetlands of Wynad (because wetlands are not much there).Money rates of poti seed shifted from 1822 to 1881.

Rates of poti(30 seer)of assessed seed Niguthi vithu in Wynad and Nilgiri Commission:-

Wynad Taluk:	1822	1881
Peria	1.13.10	2.0.0
Edavaka	1.13.10	2.0.0
Nallurnad	2.2.1	2.2.0
Ellurnad	2.2.1	2.2.0
Kuppathod	2.5.3	2.5.7
Putati	2.5.3	2.5.7
Kurumbala	2.0.0	2.2.0
Porunnanur	2.0.0	2.0.0

Tondarnad	1.13.10	2.0.0
Vaitiri	2.2.1	2.2.0
Etanattassakur	2,2,1	2.2.0
Muppinnad	1.9.7	1.12.10
Ganapathivattom	2.10.0	2.5.7
Nilgiri commission		
Cherangod	1.3.2	1.4.10
Munnnanad	1.3.2	1.4.10
Nambolakkotta	0.15.0	1.4.10

A fourth kind of paattam called Wardens paattam which approximates to the Vilachal meni paattam of Mr Rickarts came into existence.Example :-

Seed=5 poti

Outturn multiple =15

Rate in Kuppahod and Putatoi amsam.

Vilachal meni paaattam	Wardens paattam
seedX outturn multiple =gross produce 5 X 15 =75	seedX outturn multiple=gross produce 5 X 15 =75
Deduct seed =5 & valli+5 Total =10=65	Deduct for expense 5 X 3=15 =60
1/3 rd profit for ryot =21 2/3	1/3 to ryot =20
Balance 43 1/3	
Govt share 60 % 26	1/3 rd Govt =20
Janmi share 40 % 17 1/2	1/3 rd Janmi =20

The reduction for expenses in Warden paaattam is the customary rate prevalent in heavy rich amsams of Ernad Taluk.

The paattam rates by Wardon paattam was as follows:-

Place	Per 1000 Macleod seer in Rs Anna.Pai
Peria	24.1.2
Edavaka	24.1.2
Nallurnad	31.15.6
Ellurnad	31.15.6
Kuppathod	23.8.11
Putati	23.8.11
Kurumbala	25.9.3
Porunnnanur	24.1.2
Tondarnaad	24.1.2
Vaithiri	25.9.3
Etanaattachankur	25.9.3
Muppainad	36.2.5

Ganapathivattom	47.1.8
Cherangod	24.0.6
Munnanad	24.0.6
Namabalakkotta	18.12.11

Market price prevalent in Wynad since 1860 during harvest mnths average Rs 69.6.4.per 1000 Macleod seers.British Govt noticed that this was taken by the people and their Raja for a long time without giving rent to Govt.

Logan says Wynad is an exceptional Taluk due to its unhealthiness and breaking up of old systems had more effect on Wynad than elsewhere on agricultural production and cost of labour suddenly increased and the slaves chose to leave their ancient masters and work for hire on the European coffee estates .(All these happened only after Keralavarma's death is noteworthy.Till his death ,that is till the failure of the old system there,the adivasis were having a good share of produce and were supporting the Raja and after his death they moved to plantations as labourers just for sustaining their life and they lose the prestige of their ancient race as well as their leader .Taht was the co-operative system which was existing in Malabar as well as in entire India and one has to see history through the words as well as in between words)

Dutch settlements at Cochin;-

From 20th October 1795 till convention in Paris ,Dutch settlements in Cochin was under British flag and it was ceded to Britain in that year.Fort Cochin and the following paattam gardens were in its limits:

1Tumboli	33 miles south of Cochin
2.Kattur	31
3Attalakkad	27
4Manakkodath	27
5Antony Fernandez paattam	6 miles South East
6Thekkepurupunkara	6 ½
7Mundenvelli	6
8Domingo Fernandez Palakkal	6
9Santiago	5 south
10Taiveppu	4
11Belicho Rodriques	4 ½
12Saint Louis	5 ½
13Duart Lemos	5
14Hendrick Silva	4 ½
15Raman Turuthi	1 ½ North East
16Sondikalguvankure Silva	4 ½ SE
17Palliport Hospital paramba	16 North

British gave exemption from ground-rent tax for Dutch and the Christians residents (which lead to mass conversions for sustenance)

Land beyond fort was held on lease for periods of 20 yrs and reverted absolutely to Govt with no tenant right or compensation. British continued this with disadvantageous change of selling the lease as they fell in auction (pp 712 Logan). In 1847 Connolly assessment was liable to revision every 20 yrs. The Connolly revision resulted in giving the lease expired land (which was that of the rentor) to ryots /former rentors /or strangers with the auction.

July 1st 1858 Board proceedings settlements of wetlands:-

1. Number of seers required to sow 100 perukkam in each holding assessed.

Perukkam = 6 ft X 6 ft = 360 sq ft

1210 Perukkam = 1 Acre

The number of seers required to sow range from 4, 4 ½, 5, 1 and 6

2. Outturn multiple is fixed. Range from 3 to 18 times the seed

3. Extants of hundreds of perukkams X Seed X outturn multiple = gross produce of holding

4. Deduct seed and similar quantity for cultivation expenses and find net produce

5. Reserve 1/3rd of net produce for cultivator and remainder is paattam

6. The whole of the remainder goes to Govt though a 65 % share for Govt and 35 % share for janmi is there in accounts.

7. Both shares commuted to money Rs 25/1000 Macleod seers

Thus Connolly followed plan of Sheffield for Modan land and Mr Clemensons plan for distributing produce and extended it to wetlands. This 5th Cochin Plan of Connolly was different from Velachil meni paattam of Rickarts and Warden Paattam of Wynad.

Example :- seed 5 seers, outturn multiple 15. Gross produce 75.

Vilachal meni paattam	Warden paattam	Cochin plan
Deduct for expense Seed 5 Vally 5 total 10=65 balance	Deduct for expense 5X 3=15 Balance 60	Deduct for expense Seed 5 Valli 5 total 10=balance 65
1/3 rd profit ryot 21 2/3 Balance 43 1/3	1/3 rd ryot 20	1/3 rd profit ryot =21 2/3 Balance 43 1/3
Govt share 60 % 26	1/3 rd Govt 20	Govt share 65 % 28 1/6
Janmi share 40 % 17 1/2	1/3 rd janmi 20	Janmi share 35% 15 1/6

Look at the figures. Vilachal meni paattam was the old custom of the Kerala. Govt share is for social developmental, defence, education, famine and other emergency situations etc in it and the money is spent locally for the people, for the society itself. That was not much high from that of the ryot or actual agriculturer class. Landlords (intermediaries) were getting a lesser share than the agricultural class. In Cochin plan the share of ryot is preserved. The share of janmi is reduced and it is that amount that was taken by Govt. Since this new Govt did not want to invest in agriculture, the recycling of money did not happen locally and it went out of the state. The old Kings could not help his old subjects because he was deprived of his means to do so. The janmis who were contributing also were deprived of their customary shares and were hard pressed.

In Warden scheme we find a equality of distribution .It is well and good.But ,here also ,when an emergency comes,and for co-operative farming etc the kings and landlords could not help because their share was cut,and the share of labourer was cut (though minimally)and they were made to believe that the landlords are at fault .The cause for disturbance and rebellion was that reforms were made without understanding the land,its geographical needs,peculiarities,how this was kept prosperous by customary methods etc .It was a communication gap for the ancient Indian economical knowledge and the recently arrived people who did not know much of the land and looked at every attempt of the people and their leaders as rebellion and disobedience rather than understanding the problems.The rebellion of Pazasssi Raja and others ,the mass conversions etc has to be viewed thus from an economic and sociopolitical view and not in religious terms or in any other terms.

In 1828-31 prices were very low .1832 there was a high price rice.It showed no sign of ebbing.Thus the first price rise was induced by the new revenues and new systems and common people as well as landlords suffered since with price rice Govt share of paaattam also increased and the people could not sustain themselves since barter system was being replaced by Govt Currency which no one had at hand.The greatest increase in price rise since 1822 took place just after the 5 yrs ending 1856-57.(The year of the mutiny).

Average 5 yrs ending	Paddy/grace in Rs	Gingelly/grace in Rs	Coconuts/1000 In Rs	Pepper/kandi 550lbs In Rs	Coffee /kandi 560 lbs In Rs	Green ginger /kandi 560lbs Rs
1851-2	78	266	12	51	75	11
1856-57	108	311	16	85	98	21
1857-58	149	392	21	100	130	23
1858-59	166	407	22	95	121	25
1859-60	197	.....	.....	...	....	..

The price rise of rice affected people whose staple diet is rice.And the same group were having coconut gardens and the price rise was not proportionate and they could not pay revenue from coconut alone when computed into money(in cash)and they had to sell even the paddy which they had kept for their food,maintenance,and seed.

And forest rules prevented them from entering forests and eating food from there or doing minor burn and slash farming for sustenance.This was the situation which created a rebellion and mutiny and in that all people including landlord and kings were sufferers .But,unfortunately .it was later interpreted as an upsurge against landlords by theoretical historians and this is still spread and the real situation as a unification of entire people is prevented by that strategy .

Eranad,Cheranad,Walluvanad,Palakkad ,Ponnani ,Thrissur:-

Ernad Taluk is old Cheranad and Eranad combined.Boundary North Kozhikoodam and Vayya nad(Vaipuram);East Neelagiri,South Valluvanaad and Ponnani and west the sea.

Agroeconomy and Agricultural History of India

Area 811 sq miles and 140 sq miles or 1/6th under cultivation. Remainder wasteland and hilly tracks.

1881 population

Total 296143

Male 14852

Female 147622

Hindu 145,451

Muhammedan 149987

Christian 699

Other classes 6

Number of houses 60596

Occupied houses 54415

Mountains:-

Vaavul mala, chekkunna mala, Pantalur mala separating Ernad from Valluvanad, Urakath mala which was boundary of old Cheranad Taluk. The importance economically is the extensive undulating intersections in all directions of valleys of wet cultivation of rice and the valuable timber forests in Nilambur.

Forests under District forest officer:-

1 Karimpuzha reserve

2 Amarapolam reserve

3 Chathamporai reserve

4 Nellikutta reserve

5 Valluvseery block with 3 reserves Pokode, pananghod and Valuvassery

6 Nilambur block with 6 reserves

trevalikkavu, Anwakode, Edakod, Ellanjery, Ramalur, Mulataranna,

7 erambadam

8 kanakut

9. muriat

10 Karien

11 Mangalasseri

12. Ambalakkandi

13 Arimbrakaatta

14 Puthalath chittarikkal

In 1840 Connolly made Nilambur into a monoculture teak plantation. In 1843 Dr Roxburg mof sowing seed in beginning of rains in shaded beds was experimented and succeeded. Chathu Menon a local expert was the first conservator for 20 yrs and from 1863-1883 Mr Fergusson took over.

Rivers:- 1. Vaipuram (Beypur) or Ponpuzha of old Parappanad kings come from Wynad and gush round ghats to Nilambur valley, has tributaries called kalakkampuzha, and karkurpuzha, cholayar on right bank and karimpuzha on left bank. Karimpuzha is a formidable river arising from Nilgiri and Kunda mountain with several tributaries like kurampuzha, kudirapuzha, and discharge to sea at Beypore. Navigable all round year upto

Ariakode .In monsoon boats go upto Nilambur.Small boats upto Edakkara 8 miles NE of Nilambur.

2.Kadalundi from Kunda mountains southern slope enters Taluk near Chappanangadi,flow via Tirurangadi and empties in sea at Kadalundi.one branch joining Beypore river ,form chaliyam thuruthu.

At Malappuram it is called Aanakkayam.At Thirurangadi as Thirurangadi river;teak and rafts of bamboo are floated down to depots in Beypore and Kalalyi near Calicut

Consorts of Thiruvithankoor Princess were selected from the Parappanad family (Logan). The Naaluthara of Chaalakkara,Pallur,Chembra,and Pandakkal desa were also related to Nambiars of Iruvazhinad and kuranghot Nayar and were important Naaluthara of Kottayam Taluk and through Karkur pass they could reach Ernad Taluk easily.(Still the custom of Chembra Thamburan marrying a Thiruvananthapuram princess continues. Father of the singer Ramavarma Raja is from Chembra kovilakam).The Parappanad Raja had his central administration from Netuva amsam of Parappanangadi(southern Parappanad)and pepper,ginger,salted fish and arecanut were main articles of trade. Paramukku(The corner of Parappanad)now called Feroke after Tipu named it as Ferokeabad with a ferry (Beypuram ferry)and 2 miles above it in Ernad is the Chathanparambu with megalithic remnants of old Cheranad,Ernad families and ancestors.Beads and urns were excavated here.The agate beads and urns are ancient settlement remnants of the people.Captain Gillham found a very ancient fortress at the mouth of Beypore river the walls strongest at west and northwest and north angles where foundations were 13 ft across and 2-3 ft deep commencing on coarse sand and shelly bottom.southwest it is of laterite stones and chunamb,and there are small portions of masonry and concrete levellings.Who made that fort?The assumption that it was f Tipu was by the British .But the archeological facts do not prove that.Kadalundi and Nirumkaithakkotta in Vallikkunu amsam with temple of Chathan(sastha)or Ayyappa on the slope of a hill and a Melkotta temple above it on top,is infested with monkeys and is supposed to be remnants of army of Rama who accompanied him to Lanka.Netuva amsam has a Pisharikavu temple called PuthiyaRaayaru Nallur (Old Rayarunallur is in Pattambi)dedicated to Mookambika showing the relation from Northern Canara to southern Thiruvananthapuram of all Rajavansa and its deities.The Ernad Taluk list of Devadayam or Inam lands to temples is listed by Logan and 36 temples ,7 mosques and personal inam land to Kondotti Thangal are listed .

Iron was found in Chembraseri and Panthikkad amsam and gold in Nilambur valley in small amounts.coconut oil,castor oil,jaggery,arrack are manufactured everywhere in ernad.Chaliyam ,has art of weaving (called Shaleeaths in Arabian language).The enormous amount of money raised from teak and other forest plantations is listed by Logan .Calicut became an entrepot only after Zamorins time.Before that the entire area belonged to Kolathiri and the center or Kudanad was the center of entire Chera kingdom,and Thiruvithamkur was the Ilamkur or second avakasi, and Northern Kolathiri was the yuvaraja (elder son)or first avakasi .Thus one has to understand history..Then we will get an idea of ancient seafaring which made India so famous all round the world right from period of Babylon,Assyria,Sumeria,Egypt,ancient China and then only we will be able to see what role the western coastal people and their knowledge of monsoons as

the Aswath/Aswins or horse winds (in Greek Hippalos) and their secret of good economy will be better understood.

Walluvanad Taluk:-

Boundaries:-North Ernad Taluk,Aanakkayam river in the Malappuram form boundary and a portion of Nilgiris.

East:-Coimbatore district.

South Palghat Taluk ,Ponnani and Walayar river as boundaries.,Cochin state and Ponnani Taluk.

West:-Ponnani and Ernad Taluk

Area:-963 sq miles.214 sq miles (137417 acres)cultivated.273454 cultivable.3000 acres hills and forests .Rest not cultivable.

Red loam soil,with black alluvial clay in valleys.

Attappadi valley(200 sq miles area)is in this Taluk,with river Bhavani .Ghat covered with valuable timber trees and elephants .

Hills:-Panakkodan mala,Avunhikkadan mala,Chirattamanna mala,Anangan mala(of the cupid).Hills have tribes,scrubs,jungles,pasture land for cattle,thatching material for houses.,Dales are fields of paddy,borders of which covered by gardens of jack,areca and other trees.Thutha or Mannarghat river a tributary of Ponnani river is here.Several perennial rivers forming its boundaries used for floating rafts from hills during rainy season and navigable to small boats except in severe hot season.

Rainfall in inches :-

Yr	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1288	22	29	27	22	3	1	..	..	3	1	20	11	139
89	26	15	6	12	9	..	..	..	..	2	9	27	106
90	19	6	2	4	8	..	..	..	..	..	2	4	45
91	22	17	4	6	5	..	..	..	..	4	12	32	102
92	45	14	9	17	11	1	..	..	5	3	6	27	138
93	31	16	4	11	11	3	..	..	..	2	3	17	98
94	21	18	12	13	7	..	..	..	1	..	10	45	127
95	33	18	5	25	3	4	..	..	..	3	10	16	117
Total	219	133	69	110	57	9	..	..	9	15	72	179	872
averag													109

Climate not healthy and chief prevailing disease is fever.In Jan,Feb,March (with no rain)Malarial fever throughout the Taluk exists.

Population(1881)is 308102 and in 1871 it was 292482.

Males 153236

Females 154866

Hindu 225075

Mohammadan 82883

Christian 142

Others 2

Average population per sq mile 320.Atppadi valley in Arakurissi amsam ,and along foots of ghat is thinly populated.Some parts are not inhabited.

Houses 57220

Occupied 52644

Unoccupied 4576. There are 55 occupied and 5 unoccupied houses in every sq mile and on an average 5.9 persons in every occupied house. As elsewhere in the district houses stand in detached compounds except in towns and bazaars where they are built in form of streets. (Agraharam of Brahmins, Anghadi of Christian, mohammadans, Chaliya etc) Bulk of the people are cultivators of the soil.

Profession(occupation):-

Occupation	Male	Female	Total
Professional	4319	553	4872
Domestic	536	691	1227
Commercial	3065	708	3773
Agricultural	62958	20785	83743
Industrial	23564	18363	41927
Indefinite/ Nonproductive	58794	113767	172561
Total	153236	154867	208103

Language is Malayalam. Attappadi inhabitants (adivasi) speak a form of Canarese. For administration, divided to 64 amsam with an adhikari to collect tax, and is also village magistrate and munsiff. He has an accountant under (A Menon) and a couple of peons except in Arakkurissi amsam where there are 4 peons. Tahsildar with 2nd class magistrate powers is at Perinthalamanna with asst called deputy Tahasildar stationed at Chera (u) Pulaasseri.

Cultivation:- Rice, jack, areca, plantains and small amounts of coconuts grown.

Nanja 78815 Acres

Gardens 23116

Punja 35486

Punja represents upland cultivation such as modan, punam, gingelly etc. The area under cultivation of each crop varies from yr to yr, according to nature of seasons and other circumstances.

Weekly fairs or markets:-

No :	Fair	Amsam	Day	Distance From Taluk HQ Miles	People Attending	Articles of Sale
1	Mankata	Mankata	Sun	6	100	Betel, Nuts, veg Miscall
2	Kulathur	Kulathur	Fri	8	200	Same
3	Tiruvegapura	Naduvattam	Mon	14	400	Same
4	Cherplaseri	Cherplasery	Wed	10	500	Same
5	Vaniyankulam	Kunnathara	Thurs	20	5000	Same+ginger, cattle
6	Ottapalam	Chunanghat	Satur	21	400	Miscellaneous

7	Pattambi	Nethrimangalam	Tues	14	600	Same
8	Pathirippala	Perur	Sun	30	500	Same
9	Srikrishnapuram	Srikrishnapura	Tues	16	200	Same
10	Mannarkad	Arakurissi	Satur	18	500	Same+horn, Honey,wax
11	Alallur	Arakaparamba	Thurs	10	200	same
12	Angadipuram	Perinthalmanna	Sun	HQ	1500	Same+iron,cloth , oil,coconut

List of temples,sathrams and charitable institutions which gave annadaanam(food)is also given by Logans manual.

Palakad :-

Easternmost Taluk of Malabar.Between 10 deg 25' and 10 deg 55'N lat &between 76 deg 27' and 76 deg 55'East log.Comprised Pallakad and Thenmalappuram amalgamated in 1861.Boundaries North Walluvanad ,east Coimbatore &Pollachi and Cochin state ,South Cochin state ,west Cochin Walluvanad Taluk.

It was not surveyed fully and area not known in 1881 .Soil black loam.Along coimbatore and cochin borders physical aspects are unique and singular.Palakkat gap,25 miles across more than 6000 ft lower than the hills with heavy forests,ravines and jungles westward and gradually succeeing ricefields fringed with palmyra palms and several mountains and streams.Chenath Nayar forest and Walayar reserve is British Govt property and all others private.Walayar reserve consist of Varalappadi and Pulampara forests purchased by Govt for woodfuel for Madras Railways.All forests contain teak ,blackwood ,valuable timber,honey,cardamom,gum collected by jungle tribes and bartered in plains for necessities of life.

Rivers:Kalpathy(Nila),Kannadi,kollankot puzha(Gayathri).The first two join at Parali toform Ponnani Puzha (Bharata puzha)and Gayatri join it a little farther on..Kalpathy originate in Chenthaamarakkulam in hills North of Walayar where the stream form boundaries between Malabar and Coimbatore.The other two rise inKollanghot bluff called Mlaya mountainsbeing Northwest extremity of Anamalai.

Climate,health and Metereology:-

Dry season climate very hot ,during rains pleasant ,healthy.November to February strong east winds (land wind)blow incessantly through Palghat Pass which makes weather trying.Water supply satisfactory ,health of people good.Diseases prevailing are fever and small pox.Walayar and other forests have Malaria and cholera makes its appearene occasionally.

Population :-342454 in 56 amsam ,60351 houses.

Hindu 306662

Muhammadan 32330

Christian 3462

Density of population per sq Mile 559/amsam6115 and per house 5-7.Unoccupied houses 12234.

Males 165311

Females 177143

% of population increase compared to 1871 census was in respect to males 3.82 and females 6.31 or 5.09 of both sexes.

Occupations:-

Professionals 5090

Domestic 1526

Commercial 7097

Agricultural 93841

Industrial 51477

Independent 183423

Total 342454

Palghat town big Bazar was called Chethurangapetta with its busy part as Sultan petta.(after Tipu invasion).Trade is tobacco,foodgrains,especially dry grains,oils,cloths .Timber is another source of income.Famous for pullupaaya (grass mats).Brahmin community of Bhattars belong to Palghat Taluk.19 gramams of them in the limits of the Municipality.

1.Kalpathy

2.Pazhaya kalpaathy

3.chaathapuram

4.GovindaRajapuram

5.Komaarapuram

6,LakshmiNarayanaPuaram

8.Mukkaa

9.Chokkanathapuram

10 Puthamkurissi

11.Sekharipuram

12.Ramanathapuram

13.Tharekkad

14.Vatakkumthara

15.Nurni

16.Nelliseri

17.Thondaikkulam

18.Pallipram

19.Thirunilaayi

Kalpathy,Mukkai(confluence of Palayar,Malayar and waalayar in Elappali Amsam to form Kalpathy river)and Rameswaratheertha (made by Rama at request of Lakshmana during vanavasa to bringGanga waters)are holy places.

Alathur ,is the land of Ala or Vezha trees(Dalbergia to make mortar).From there one can get to Cochn border of WadakkancherryIn vicinity of Alathur is Velumalai (Vizhumalai)for trigonometric observations.It has a large cave and a natural spring higher up which is never dry.There is a ruined old Hindu temple there.The cave was inhabited once.Portion of wall dividing cave into compartments/herths and a small mill is seen.

Vadakkancherry is the Northern village on North separating from Cochin state.Trade of forest produce and timber is carried on here.An ancient Hindu temple “Tirunara”with a

spring and tank “Brahmakunda” is revered as place where Brahma did sacrifice. A handful of sand from the tank is taken by Nambuthiris who perform yaga.

Kollanghot is in Padinjarethara amsam. It was the seat of ancient Venghanaatt Nambidi, members of which family still live there. Kachankurichi temple is here. Sacrificer come to this temple before a yaga to get moonplant (*cynanchum acidum*) skin of black antelope and black wood (*mimosa catechu*) from Venkanat Nambidi. 6 & 3 miles respectively from the temple, on Thenmala, separating it from Cochin state are two natural springs, the Sitharkundu and Govindatheertha.

Paalathulli is inhabited by Chetty and Puthunagaram by Christians and mohammadans.

Weekly markets;-

Paalathulli	on Sunday
Konghat	Monday
Alathur	Wednesday
Vadakkancherry	Thursday
Paara	Thursday
Palghat	Friday.

(Palathulli and Konghat are famous for cattle markets)

Apart from Alathur, a survey station is there in Kurachimala.

Silent valley is a evergreen forest on western slope of Kunda mountains, covering 70 sq miles with grasslands for grazing and this was prevented from 1883. It has poonspar, iyinee, ironwood, red and white cedar, wild jack, cadomom, dammer, rattans.

The wide system of interconnected markets and weekly Chantha (fairs) annual fairs at temples, and pilgrim centers at extreme North and extreme south and the internal trade facilitated by traditional guilds and routes are important and were important in Indian agroeconomy from prehistoric times and still continues to be so. With a wide variety of raw materials and produce, and with these internal markets, extending to international markets made India prosperous then and even now. Because even in the present recession years India has a growth of 6.5 % due to the produce and internal markets and a system of its own for survival despite all adversities, and that is because of its geographic nature and this is what we, as well as the Global economy should understand. If we do not upset that nature, entire global economy will improve through the medium of India.

Ponnani Taluk:-

Is the Southernmost Taluk of Malabar. Since our area (Punnayurkulam Parur Padavu) is within this, this will be treated in a separate chapter.

Textile markets

The textile market and the agrarian rural and urban economy of India The oldest reference in the Ithihaasa of natural red cotton gardens is seen in the Ramayana. In 17th, 18th centuries the greatest cotton supplier of the world was India. Europeans were interested in cheap mass consumable clothes while Persians, Babylonians were interested in fine silk and both were specialties in India. Among designed garments the cheap printed and the costly woven design Existed. Because of preference for cheap variety in

market, the specialization occurred in large villages of Gujrat, Coromandel and Bengal. English and Dutch dominated the trade. The production organization in villages was clustered around trading centers. Co-ordinated with merchants who traded in the town, the village traditional guilds prospered. The pattern of location and ethnic composition of buyers and producers had an important role for Indian merchants and intermediaries. Naturally the hereditary weavers were prosperous. Then in 1820 trade dwindled and they suffered. The cotton famine of 1860 in India due to Manchester cotton markets is well known. The system of *basaks* in Bengal was to make contract with weavers and give advances of money and raw material. This can be used as a tool for bargaining and involve coercion. The fulfillment of contract was a sort of debt. For Indian goods Europe gave gold and silver (bullion inflow to market). This existed in India even before, and what they did was getting the monopoly of the gold which served as currency in *sathavahan* and *vijayanagara* periods. Gold was more than currency, a saving in India.

The rural area contributed subsistent food crops, raw materials, export quality goods, and the urban centers had marketing centers and did capital generation and gave raw material for export quality goods to rural area. The export markets bring gold and silver for savings

and as raw material for workers to make export quality ornaments. The export markets in Bengal and Cholanmandalam and Malabar were famous in pre-colonial India. British made first centers in Bengal, Madras and Malabar due to this very reason.

1790 saw 50 million yards of cloth exported which only 1-2 % production is of India. (M.J. Twomey .Employment in 19th century Indian textiles .Exploration of economic history of India 20. (1.) 1983. Table 1) The internal trade in pre-colonial North India: There were small exchanges in rural areas for rural produce with or without local markets. Periodic markets in large villages on specific days where commodities of all types traded. They will be mainly the necessities for day to day life of people.

The second level limited regional trade in small towns and permanent markets .Higher value goods like sugar, oil, ghee, butter, fine clothes available here. (Kessinger .Regional economy pp 247), and the area and range expanded when water transport was available. The 3rd level was the entirely urban long distance trade in luxuries. Mohenjo daro, Harappa, Dwaraka etc were land and sea port centers which catered to such activities. Caravan pack bullocks from entire country reached such places through a nexus of routes protected by special guards of tribesmen living in the hills and forests.

When British expanded this trade they first captured the monopoly of the long distance major trade centers and routes. Abolished the old guards and even the forests from where they did guerilla warfare.

The function of the *kanakkar* /*sreshty*/accountant class were four-fold.

1. converting the weights and measures

2. bill discounting

3. remittances

4. leading to the local elite

These people who kept accounts of long distance trade and urban economy were called shroffs and they got political power through helping the British. For example Jagath seth house in Bengal. In Malabar and Kerala were the Nayar guilds and they did trouble the foreigners and hence were curbed along with their chieftains who were engaged in land and sea routes. The Indians saw EIC as a new trade house or a renter only and they never expected that they will destroy the entire system of their economy. Therefore the rights to revenue over large states was given. In 1790 the income from export trade declined and by then EIC was ruler of Bengal. How this happened?

1. They defended trade from political interference of native rulers

2. They interfered with the natural conflicts over possession of wealth among local rulers

and made it their benefit.

When export income declined the company concentrated on land income and started direct rule. Then started territory expansion. They slowly made impact in order starting from trade, agrarian relations, industry and infrastructure of the country's economic backbone. Bengal surrendered, and in 1856 Ayodhya too. Then only the people and the rulers realized the impact of what was happening. By 100 years they have lost all rights whatsoever on their motherland. And the result was 1857 Mutiny.

Year wise -most important exports from India

1811	Cloths Opium Indigo Raw silk Raw cotton Sugar	33% 23.8% 18.5% 8.3% 4.9% 1.5%
1850	Opium Cloths Indigo Sugar Foodgrains	30.1% 19.1% 10.9% 10% 4.1%
After 1850	Indigo and opium replaced by cotton and jute from Surat, Bengal and Sahyadri Tea and leather export increased. Estates, and increase in cow slaughter	

	In 1850 60 % textiles and metal imported In 1870 import was of machinery and intermediate goods.	
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Scale of foreign trade (excluding treasures) 1813-1913

	Import	export	% share of trade in National income
Bengal 1813	16	46	-
1839	57	120	-
British India 1835	48	111	1.1-2.4
1857(mutiny yr)	153	275	3.6-4.8
1913	1913	2490	>20
			National profit increased only after queen Victoria took over.

Average annual growth rate %

Bengal	year	Import	Export
	1813-27	6.5	2.4
	1828-39	1.1	1.9
India	1835-57	6.3	4.9
	1858-1913	5.0	4.5
	1858-1913(excluding 1866 as outlier)	5.	5.3

The average annual growth rate of India did not increase, but it did decrease. 1800-1850 was the indigo-opium era. Indigo cultivation flourished. The natural indigo was then substituted by synthetic one and sudden decline in markets affected the indigo farmers of Bengal. Opium in Bengal was cultivated under Government monopoly of British. In late 18th century it was only a small item of export to China. EIC made it the payment for Chinese tea, silk, porcelain which were exported to Europe. China tried to stop the opium trade and British fought two wars with China for this. Only in 20th century China and India could stop this trade by a common agreement. Sugar and raw cotton, indigo and opium sustained the commerce of Eastern Gangetic economy in 1st half of 19th century.

The agrarian change

This was pursued with great determination for maximization of land revenue .Fixing revenue in cash and not as proportion of the output was the first drastic measure and assessment was done uniformly all over India without considering the productivity of different regions. Especially severe in Ryotwari settlement areas between 1820-50.The prices fell, burden increased, even the tax-free tenures subjected to tax, tax collection made more” efficient” and cash crops(sugar,cotton,indigo,opium,nuts,tea,rubber increased)given preference over subsistence foodgrains for getting cash payments. Even single jackfruits were taxable .Sale and auction of land increased with revenue defaults and propriety rights defined differently. The grain traders who were strong could purchase the transferred land and continue cultivation to some extent. Cash economy depended on financiers. Poor peasants suffered. The part time peasants who were artisans were particularly affected by the double change that came. People who live on animal husbandry ,the shifting cultivators all suffered alike by the changes. In 1858,the high revenue demand was slightly relaxed and the areas of cash crops were given revenue ease with expansion of irrigation ,cultivation of arable waste ,rising prices and profits.

From where did the intellectual roots of the British come from to induce such property rights in India which is still followed by us ?

Erik Stokes traces it to the Ricardian idea that rent is the only income that can be taxed without discouraging production. Others think that it was a stimulus for enterprise. Was it just a theory or a local condition that they had to practically tackle to make benefit for themselves that stimulated the British ?Did they change the local condition? If so in which way ?Sometimes suppressing and sometimes collaborating with the local regional ruling class ,as well as the common people of India did get their way.Collaboration was a massive example for asymmetric information between ruler and the ruled for them. They pictured themselves as the supreme landlord ,and thought they had rights to do what they thought justice and did not know that they were doing damage to a well established system of ecology and economy based on agrarian ecosystems. They did really change the system but out of ignorance of its impact in the future. By 1840 traditional community was lost not only in Bengal but everywhere in India. The community had become a business resource .And naturally it ceased to exist or was fast disappearing after surviving millions of years.

The ancient system of canals for irrigation were in a state of disrepair decades before the company rule began. The returns to such investments were expected to come in two forms.

- 1.Indirectly as increased revenue charged on irrigated land and prevention of famines
- 2.Directly as water rates. These were remunerative investments.Upto 1870 such public works were under a military board in North India since the investment was of a strategic value. In 1830 British started to replace the old wooden ships of India by iron ships powered by steam. The Indian shipbuilding industry which had more than 6000 years history dwindled .1835-1855 for postal, telegraph and railways forest clearing happened

and fields destroyed. By 1857 the basic structure of land revenue was established and it was very high and joint stock banks and exchange banks came up in India which completed the macroeconomic transformation.

Agrarian change from 1858-1947

After 1900 agriculture cannot generate rapid economic growth in India due to these factors. Only in 1970-1980 it could revive following the green revolution of wheat (only in Punjab). Why this stagnation? The past alone can explain the present Indian agriculture.

Growth rate of net domestic product (NDP) Total and agricultural 1868-9 to 1946-47:-

Year	Agriculture	NDP	Population growth rate	Per capita NDP
1868-98	1.01	0.99	0.40	0.59
1882-98	1.08	1.28	0.51	0.78
1900-1946	0.31	0.86		-0.01

Before 1890 the universal phenomenon in India was expansion in net sown area and land under food grain cultivation in all major areas of cultivation. This was so till the second half of the 19th century. By 19th century the cash crops were increased. The areas of increasing cultivation was by the united effort of the village and the irrigation facilities provided by the leaders/rulers/rich merchant class etc who also belonged to the village. Between 1890 -1947 all details collected, checked and analyzed by British Indian Officials and their method of estimating production for survey purposes was “Total agricultural output in one year for a crop calculated as follows (Taught to them by the old village Patwaris, chowkidars etc)

Production= Area cultivated in that year X std yield per acre X condition factor for that year.

Std yield=the average or normal yield in a normal season. Estimated by crop cutting experts in sample plots in a normal season. Periodically revised by similar experts.

Condition factor= Actual yield as a ratio of the normal yield”

For every village, for every field there is a normal and the yield is calculated according to that. Condition factor is the district as a whole based on sum of the village level observations. The drought year condition factor should be less than one. Exemplary good year more than one. The rain, the weather prediction, and harvest is predicted in the first day of year and with that the planning for the year is done as early as possible. This is the collective co-operative action of the village as a whole.

Actual measurement of rain and proof of prediction std yield etc are estimated independently and did not show variation annually. The condition factor:-the given work (the probability theory of management)+the actual measurement. The acreage estimated but varied slowly. Condition factor was the function of the seasons, which can

fluctuate. In practice the condition factor was always reported as less than one. Reasons being:-

1. Standard yield was set too high
2. Officially interpreted the std yield to be the best possible output rather than the normal or average output.
3. Officials suffered from a universal and persistent pessimism about agricultural condition.
4. Deliberate reduction to press for revenue remission was suspected by British. The village officials could predict whether it would be good or bad harvest with great accuracy of judgment. They knew strong correlations between rainfalls, the most important factor behind seasonal fluctuations and the other condition factors. Condition factor was a measure of the fluctuations. The long term trend in condition factor which every one knew was the monsoons. Between 1890-1940 the condition factor of Bombay presidency showed a downward trend. The pathwari/Chowkedar was giving the information but Clive Dewey thought that the data were wrong and purposely given to evade revenue of that permanent settlement. But the overestimation of the std yield was to compensate for any underestimation of the condition factor so that the compensation for each other in aggregate would give correct value.

Agricultural trends in India were studied between 1891-1947 by Monumental work of George Blyn. He suggests seven basic things.

1. From 1891 to 1946 the average growth rate of crop output was small at 0.37 %.
2. Foodgrain output was stagnant and nonfood grain output growing quite rapidly
3. The output growth rate was small due to the small acreage growth, because there was no cultivable waste land after 1891. Another reason was the yield per acre grew slowly and declined in food crops.
4. Until world war 1 the yield per acre of both food grain and nonfood crops grew. In interwar period food crops had precipitous decline
5. Among food crops rice suffered worst stagnation and wheat was growing
6. Regional experience varied. Bengal experienced decline than any other place in India. Both types of crops were below average growth rate and yield per capita. Rice per acre yield fell sharply in Bengal and in Madras it raised.
7. Until world war 1 food output grew more rapidly than population, with availability of food to all. Interwar period the population growth rate increased food output rate

decreased and decline in food availability per head happened. This was most acute in Bengal.

These show that the commercial food crops more than the subsistence food was grown and commercialization of agriculture productivity can be correlated. The regional differences was very important .The tables of Blyn are quoted here for better understanding of facts and figures.Trend growth rate of crop output .Average and yield 1891-1946 with growth, stagnation in the yield(per acre %PA):

	Growth in output	Growth in average	Growth in yield per acre	Growth & stagnation 1891-1916 %PA	Growth stagnation 1816-21 %PA	From 1921-1946 %PA
All crops	6.37	0.40	0.01	0.47	-0.36	-0.02
Food grain	0.11	0.31	-0.18	0.29	-0.63	-0.44
Nonfood grains	1.31	0.42	0.67	0.81	0.34	1.16

Trend growth rate output of major crops 1891-1946 % PA

food grain	Growth rate	Nonfood grain	Growth rate
Rice	-0.09	Cotton	1.30
Wheat	0.84	Sugar cane	1.30
Mower	0.05	Tobacco	0.03
Baja	0.72	Groundnut	6.26
Maize	0.02	Jute	0.27
Rage	-0.37	Tea	2.74
		Indigo	-6.19

Precipitate output and growth rates of output in major provinces (1891-1946)Trend growth rates in %PA.

	Growth rate(out of all crops)	Percapita food grain output in tons 1891	Per capita foodgrain Output in tons 1941
Greater Bengal	-0.45	212	147
Rest of British India	0.82	160	168
United provinces	0.42	123	130
Central provinces	0.48	207	149
Bombay and Sind	0.66	195	152
Madras	0.98	146	163
Greater Punjab	1.57	140	201

Relationship between agricultural output and population growth rate(1891-1946)%PA

	1891-1916	1921-1946
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All crops	0.84	0.34
Food grains	0.61	0.13
Nonfood grains	1.66	1.08
Population	0.44	1.12

The investment in agriculture was small or negligible. Investment in irrigation was done by Government investment. The increase in acreage of cropped area from 12 to 22 % between 1885-1938 was due to canals made by Governments & private sources. Canal and wells constituted in only three areas-Punjab, Madras & western UP. The growth in these areas was due to this. Canals encouraged a change in cropping pattern and raised value of land which stimulated private investment in wells.

Area irrigated 1885-1938 in million acres ,excluding Burma:-

Area irrigated by	1885-86	1938-39
Government canals	6.90	24.41
Private canals	0.94	3.53
Tanks	4.38	5.87
Wells	8.74	13.21
Total irrigated	23.09	53.73
Total cultivated	185.09	243.58
Irrigated/cultivated area %	12.4	22.1

Irrigated area as proportion of cultivated area in major provinces British India 1885-1938(% excluding Burma):-

Area	1885-86	1938-39	% increase in irrigated area due to Govt Canals	% increase due to wells
Punjab	29.3	57.4	95.5	9.3
Madras	24.1	23.5	49.6	18.6
UP	19.3	26.6	57.0	37.2
Rest of British India	6	12.5	31.3	10.7

Commercialization: A process where peasants produce for sales in distant markets ,than to the needs of food in the region or for selling in local markets. The commercial markets existed in a very well organized form in pre-colonial India. Their character was changed by the new rulers to suit their own needs.

1.The weights and measures. Were perfected from prehistoric times in India. Each region had developed them independently and depending upon the availability of raw materials. Therefore conversion was needed just as we do conversion now for world trade from Rupee, dollar and pound etc.This was done only with the mathematical expertise and by

local scholars. Due to well developed mathematics in India every peasant knew this. But this was unknown to the British. So they adopted only one of the systems and made it universal for entire India.

2.The transport system Was through dangerous territories with strong security which the British could not access or control. Therefore they needed their own transport system and abolish the transport system of natives as well as the security systems.

3 Barter This was a serious constraint over the British. So they changed all the three .Later on this tend to integration of global regional and local markets and global economy ,though it broke the Indian economy.

4.Export Was a major source of demand. In post-1858 period it lead to integration of entire world trade into pre-colonial Indian world trade. This lead to the development of the present developed countries ,though India became from its developed status to underdeveloped and developing country status.

5.Accelerated development Of financial markets ,and development of land and labor related to it.

The earlier commercialization based on indigo and opium of Eastern India became less lucrative after 1850-90.Indigo cultivation shifted to Bihar and eastern UP districts from Bengal and thereafter declined. The reason for shift was Bengal revolt of 1860.Farmers protested against the forced and extortionate cultivation of this crop by British planters .In UP it had a voluntary character and had canal irrigation. It persisted there till 1870. Then a mineral dye discovered and indigo cultivation declined. Cane sugar and Silk (Bengal exports)also declined. Cane sugar was from Bihar. In 1850 beet sugar in world market replaced it. But local markets grew. Therefore sugarcane cultivation did not disappear totally. In early 19th century British firms withdrew investments from Bengal silk and its trade .After 1850 cotton and wheat export expanded and trade augmented by oilseeds ,tobacco,groundnut,sugarcane .Rice production increased only in a small way.The demand and supply factors behind commercialization increased with industrial revolution for raw materials and food. Steam shipping was quicker and cheap .In 1869 Suez canal opened and shipping cost between Europe and India declined .People were specializing in nonfood grains or cash crops and the fact that unless they make the foodgrains for their own sustenance the economy will collapse was forgotten .

Average cropped British India 1891-1946(annual average):-

CROPS	Millions acres 1891-95	% of crops	Millions acres 1941-46	% of crops
Rice	66.0	37.3	74.1	36.0
Wheat	21.9	12.4	26.4	12.8
Jowar	20.9	11.8	22.1	10.7
Gram	11.1	6.3	15.1	7.3
Bajra	11.7	6.6	15.1	7.3

Barley	5.2	2.9	6.7	3.3
Maize	5.1	2.9	6.3	3.2
Ragi	4.4	2.5	3.4	1.7
Total foodgrain	146.0	82.5	169.0	82.0
Cotton	9.6	5.6	11.6	5.6
Sugarcane	2.9	1.6	3.6	1.7
Jute	2.0	1.1	2.5	1.2
Groundnut	0.4	0.0	5.6	2.7
Oilseeds (rapeseed,mustard, Linseed,sesamum)	12.5	7.0	11.1	5.4
Indigo	1.4	0.8	0.05	0.0
Total nonfood grain	30.4	17.2	36.5	17.7
All crops including others	177	100.0	206.0	100.0

Cotton, wheat and sugarcane were in demand in Europe and became the major cash crops and their acreages increased. In India the major cotton producing areas were Khandesh ,South Gujrat,southern Bombay ,Deccan,Madras ,and Punjab. Wheat export was from Punjab,UP,Bombay and Deccan .In Punjab where it had been the staple diet of the people suffered hunger. In Bombay Deccan the staple diet was millets and wheat was grown merely for export market so that people did not suffer. In India a range of drought resistant millets dry land foodgrain millets existed and were consumed locally even in drought conditions.

Sugarcane was used to make Gur (gula/Undasarkkara in Malayalam) and the Khandasarkkara (sarkkara achu in Malayalam).These were made in small rural units. The high impurity of molasses was there and it was cheap. It was an off-season rural industry. The competition with modern factories which make refined white sugar (initially called khandasaari mills) was heavy for the rural industry. Crushing of cane with wooden mortar and pestle changed to two-roller mill in 1874.Cultivation was more in UP, Punjab ,Bihar, Bengal .90 % gull and all the khandasarkkara came from these four provinces. To increase the cash crops ,Punjab wastelands for pastoralism was converted to irrigated cultivable lands in 1867-1892.From 1890-1920 agricultural production in Punjab increased .In Punjab uncultivable waste converted to arable land by irrigation and rest of India cultivable wastes brought under the plough. The doab became famous for wheat and cotton while the SW Punjab (Haryana)specialized in livestock ,dairy and fodder crops.

In west India Konkan coast was rich in paddy.Gujrat with cotton from ancient times and both were in direct contact with Bombay the city of export. Bombay was also connected to dry interior region of cotton growth. The poor communication and absence of railway left out the rice-based Konkan out of the new commercial networks.1843-1873 saw 67% increase in cultivation in Bombay Deccan and cotton lead the increase. Bengal was paddy based and no change in its crop pattern happened. Marginal shifts to indigo, jute and sugarcane happened. Bengal rice had an old long distance trade. That now expended but

changed direction. The land and river routes changed and by railway the industry of Ranigunj, supplied serampur, Calcutta and North Bengal and Assam plantations. Also it went to other British colonies. Jute and rice trade persisted as it was voluntary while indigo trade was opposed by local farmers and stopped.

1847-1852, prior mutiny period the coastal irrigated delta of Godavery Krishna had a long distance trade in paddy. This as well as oilseeds, sugarcane, turmeric, tobacco, chilli, and plantains were grown. Economically prosperous towns of vijayawada, Elluru, Rajamunthry, Visakhapattinam existed. Tobacco was speciality of Guntur. In contrast to north Andhra of Godavery Krishna delta, the southern Andhra or Madras Deccan has scanty rainfall and low fertility soil. Famines occurred, resources were poor and high risks of cultivation existed. Shift in cropping pattern and direction of trade by railways the people had to depend upon millet called thina alone. Millets, cotton, oilseeds and fodder crops were grown by people. 1860-80 railway connected Bombay to Berar (Bedapura). Expansion concentrated in two areas.

Narmada valley with Youdhpur (Jabalpur) and sagarapura (saagar). Cotton industry had centers in Berar and Naagpura (Nagpur). The largest migration farm laborers from Chattisgarh to Berar happened and the entire population of bedda (Veda), naaga and other adivaasins became laborer class. Tamil Nadu has several agro ecological regions. The wet districts are Thanjavur, Chingalpet in Kavery delta and grow paddy and do not depend on rain for its growth. Cropping pattern is same as coastal Andhra and Bengal. The dry interior (Coimbatore, Selam, Thrissinappally) the most important crops were coarse millets and black cotton. In Coimbatore, Madhura, Thirunelveli and Ramnadu these increased. Cotton processing and packing became livelihood of small towns in these areas. Madras and Coimbatore became centers of textile industry. Second important cash crop was groundnut in south and north Arcot. Madurai and Coimbatore had well irrigation systems which played a keynote in post-independent green revolution of Tamil nadu.

The temple lands were always leased to tenants and the crops were shared as a common pool for all. It had no tax due to this reason. It was protected land of the people and its tenancy meant permanent security even in times of natural calamity/famine. But this changed in new law. Tenancy came to be associated with poverty according to British view and this view spread rapidly. Agricultural labourers did not exist as a class in pre-colonial India. Every one was tenant in the common land of God. In 19th century India the laborer class increased. There was a laborer market for the European industries.

The reasons were :

1. Precolonial comparatively egalitarian village community produced its own subsistence food and exchanged it, other articles and services. Forced commercialization broke up the system and created a class of poor agricultural labors and tenants and rich zamindars.
2. The artisans lost their traditional jobs in which they were experts. This happened with industrialization. The blacksmiths and woodworkers and other artisans were given a piece

of land and asked to do agriculture which they didn't know. Without expertise they could not get good produce. These people became helpless and became labourers in different industries out of sheer necessity. Instead of bringing equality, the individual property rights actually brought about a class of rich landlord and poor tenant and landless people .

3.Wages and tax became cash and not barter or service. And cash was European currency and not old traditional currency of the land. Both the rich and the poor did not have the cash .In South India the standard of living,food,dress,everything was the same for rich and poor in villages. This changed. The relation of people changed from co-operation to one of enmity, envy and suspicion when individual property rights established.

4.Just like lands ,the land labourers also could be traded and in that laborer market several poor people became workers of estates and plantations and in industrial construction areas. This happened especially in old hilly and forest areas where people

became mere serfs to the estate owners. The propaganda spread hatred to the British rulers as well as to the rich estate owners(native)alike who sided with the British laws and regulations and succumbed to it .They were accepting the dress code, code of conduct ,other social dictates of the British as occupational choice under the British masters and the security offered by them.

5.Migration within and outside agriculture increased. Migration to cities from rural area increased. The agricultural lands were abandoned. People entered plantations, mines, urbanservices,public works, government utility services as white collar jobs .

6.Religious conversions of tribals in South India was to get food, shelter ,jobs and to get rich,(out of poverty)and not out of any preference for the new religion.

7.Food security during natural calamities and famines was gone and peasants started to loot the treasury (Deccan riots).This was a vicious circle. Money wages lead to rice in price, and to more wages, and more price rice. If no food is grown and no purchasing power also, in difficult conditions extreme starvation ,famines etc revolts, crimes and thefts increase .This we are still witnessing.

Did the changes improve the standards of living as promised ?Does the system of credit cause the backwardness of the country?

Was commercialization forced by revenue or rent demand? Did it exist before? Where loans taken for payment of revenue or rent in pre-colonial period? Or for some other purpose? Was there a moneylender class in rural India before? Was there large sale disposessions? Did the moneylender ownership of the land cause agricultural stagnation before ?The answers to such questions will provide an exact picture .

All these existed before but was different from the new system of revenue,rent,individual ownership or cutthroat competition and exploitation of all resources. The system had a different dharma. The loans were for improving agriculture and trade and for benefit of

all. The moneylenders were lending with a vanijyadharma or kulasanghadharma .They were called the Mutharaya or Arhat classes(The Araya/Arya)as sreni or samgha/gana worked in unison with the people and the king for both land and sea trade advancing loan for the prosperity of the agriculture and crafts of the land .There never was large scale disposessions. Ownership of land with moneylender can cause agricultural stagnation if he is not one among the agricultural class but came from a purely commercial background with selfish motives.Krishi,Goraksha and vanijya were vaisikadharma with integrated co-operative basis and well spread branches all over the land .If these are separated the problems happen in each sphere. Erik Stocks statement that in Narmada valley no distinction occurred between agricultural and nonagricultural class is noteworthy(Peasants ,moneylenders and colonial rule .An excursion into central India Sugatha Bose ed .OUP Delhi 1994).The situation described by William Logan in Malabar is an excellent source for understanding wet land and coconut garden farming of Kerala and is discussed as a separate chapter.

Rainfall and cultivation.

There was positive correlation between average rainfall and rice cultivation and positive correlation between low rainfall and millet cultivation. When data on land-man ratio is added one can deduct that, a combination of rice production, and assured rain fall normally meant mitigated impact of famines and rice cultivation being labor sensitive ,rice, rainfall associated with high population density and low land-man ratio. The only exceptions were Burma and Assam but between 1901-1931 Assam became destruction of land hungry Bengali peasants.

Agricultural ecology 1901 census of India vol 1 part1 calcutta pp190:-

ZONE	MEAN ANNUAL RAINFALL IN INCHES	POPULATION/SQ MILE	% SHARE OF CROPPED AREA
Punjab	20	200	Wheat 47
Western Indo-gangetic plain(west UP)	31	409	Wheat 24 Millet 35
Eastern Indogangetic plain(East UP,Bihar,W.B)	48	490	Rice 59
Bengal delta(now Bangladesh)	71	552	Rice 80
Brahmaputhra valley	92	84	Rice 73
Deccan(south of Narmada ,East of Ghats,Mysore plateu,parts of Hyderabad)	30	151	Millet 57 Pulses 17

Gujarat	27	182	Millets 52
West coast(Konkan ,Malayaam/Malabar)	104	334	Rice 75
South India interior Tamil naadu	33	259	Millets 50
East coast (south India)Coastal Tamil nadu and Nellore	48	359	Rice 50
East coast north (Krishna Godavery delta)	52	229	Rice 65

Annual rainfall over 100 inches happened only in three areas 1.West coast from

Narmada valley to Cochin (Which is traditionally the area where King Mahabali ruled in prehistoric times)2.West Bengal.3.Assam.

Venad got 40-100 and in areas with this rainfall rice was cultivated with rain +irrigation. In 20-40 inch rainfall areas (Interior Tamil nad,Gujrat,Deccan,South of Narmada,east of Ghats,Mysore plateau,Hyderabad etc)millets were chief crop and in western UP also millets was staple diet.(In sangha and Vedic literature millets/thina/barley cultivation is spoken of).

Land use 1885-1938(in million acres)

	1885	1921	1938
Cultivated area(including current fallow)	186	254	258
Uncultivated area	98	90	94
Uncultivated –not available for cultivation	59	66	68
Forests	49	101	101
Total area (net states +Burma)	391	511	521

In pre-British India the entire land of the subcontinent being that of God, peasant population could migrate to anywhere and use uncultivated fallow land with a verbal deed from the local village panchayath and chief. British prohibited this by law. All people had to become sedentary permanent settlers .Sedentarization and peasanterization of those people who depended on common land, of the idaya and girijana,vanavaasi people happened(1855 Santhal rebellion in west Bengal was due to this, just two years prior to the 1857 mutiny).

Small scale industry

	Large scale	Small scale modern	Small scale traditional
Organization	Factory .several 100 workers+supervisory staff	Less than 100 workers	Household small factories
Technology	Steam,electricity,modern machines	Limited use of machines	Hand tools
Regulations	Factories Act, Acts governing employment, and management	Some regulated, some are not	Usually not regulated .According to Kula dharma which is a type of regulation inherent in them
Vintage	Colonial	Colonial	Pre-colonial
Examples	Cotton mills, jute mills,steel,sugar and paper	Foundry, rice &flour mill, oil mill, weaving with power looms	Handloom weaving, making baskets, wooden tools etc pottery

Total employment and industrial employment (1911-1991)

Year	Industrial employment(in million)	Total employment(million)	%share of industry in total employment
1911	17.5	148.9	11.8
1921	15.7	146.4	10.7
1931	15.6	153.9	10.2
1961	20.0	188.7	10.6
1971	17.1	180.7	9.5
1981	25.1	242.0	10.4
1991	28.7	306.0	9.4

Annual rate of growth in %(with decline of industrial employment)

1911-1931	-0.6%
1961-91	1.2%
1981-91	1.3%

% share of industry was 11.8 %in 1911 and is only 9.4 in 1991.India is more industrialized now than a hundred years before, and despite the stagnation in employment share ,the share of industry has grown up in national income. In 1961 -1991 a shift from household industry to informal factories (from firms that use less productive, less speculative labor to more productive tools and labor)took place and this shift reduced total employment but increased productivity of labor .

Women's employment in industry(From 1911-1991)

	1911	1921	1931	1961	1971	1981	1991
% share of women in industrial employment	34.3 %	32.1%	29.7%	27.3%	12.9%	14.8%	16.5%

From 1911 to 1947 there was total and per worker income growth of 1.5 to 2% per year and productivity of certain industries like textiles(Thanthuvaaya),tanning(chaamar/paraya)metal works(blacksmith, goldsmith class of aasari,moosaari,karuvan,thattan)increased .When they became unemployed .unemployment and underemployment happened. The women who were participants of all industries and in agricultural work of the family also lost the share of employment .In pre-colonial India charmer bartered his goods for grains with village, rural and temple people ,with performing artists etc.The scavenging of each village was done by one official family of chaamar I always wonder ,why were they

always kept outside the village premises? What I believe is that it was for two reasons, one being the disposal of the dead animals, tanning etc has an uncanny sight within the city/village and the second is for the reason of avoiding bad smells ,environmental pollution etc by the animal carcasses with which they worked. The aesthetic and the medical reasons must have given them a poachers(outside family poition)while the other workers were akachery(inside families/Akam)The position gave them certain other important jobs like spy work and letting the insiders know whether an enemy is coming. The multiple works for which a chaamar was paid by the village included:

- 1.Looking after the entire village from the strategic outpost where he dwells
- 2.The messenger job in emergency and in day to day life
- 3.tanning
- 4.scavenger jobs
- 5.participate in agrarian work in seasons
- 6.traditional role in religious and festival rites.mela
- 7.Sometimes magical cures /healing. musical instruments playing etc

In large villages one or more families with men ,women and children lived in a cherikkal or cheri which is a jointly owned traditional factory by them for production of their articles. And family apprenticeship gave them opportunities to become expert in a profession. The family itself was the firm or production unit whether in agriculture or industries. The master and the apprentices(shishya)went together. Usually there will be sons and nephews as apprentices to all skilled people. And others from neighbouring

villages join, if the fame of ones art and skill is famous. In all skilled crafts among artisans this existed just as in Gurukulas of ancient learning. The system was same. The craft learned and expertise obtained was different. Successive experts, masters and apprentices(guru/shishya)were generated by this system .These sangha of families were called the kulasangha (kul/kol/koul)and were the ancient guilds of India which existed from Kashmere to Kanyakumari on the same basis. If this is not administrative unity and efficiency what else can be this? In contrast to the formal organized guilds of later Europe which existed on cutthroat competition and destruction of each other, these guilds functioned on basis of co-operation and protected each other in need. In north India during the Moghul period the Guru was called the chief or Usthad and in South India the term persisted as Guru or Aasaan .The chief of a tharavaad as Kaaranavar was the ruler of the entire land belonging to one system of kulasangha (as Kakkatt kaaranavar in thalappally dynasty of South Malabar ,of which Punnayurkulam is a part).This system weakened with industrialization and individual property rights and by 1947 it had disappeared.

Entrepreneurship in pre-colonial India

In pre-colonial prehistoric India trade and commerce of the common land produce earned profits and these were spent for

- 1.Assets as gold jewellery to the temple nidhi
- 2.Building temples,ships giving opportunities for artisans to earn as well as exhibit maximum Talents
- 3.construction of ghats ,irrigation facilities for improving production
- 4.charity relief for famines, and natural calamities
- 5.daily expenditure of the village community through temple/village organizations as a common pool
- 6.Maintaining educational services through the teachers of community

We have ample evidences for this from sathavahana .chola,pallava,vijayanagara periods Not only the emperors but also chieftains, their family members, chiefs of the tribal kingdoms did the same and the system was uniform. As I write this today's Hindu daily(10th August 2009)reports having found cave inscriptions from Naamakal .It shows vijayanagara,chola period inscriptions of temple grants.ThiruAaraikkal is the name of naamakkal in inscriptions. One maanilam of wetland at vettanpadi as thirumadaipallipuram to vedanayakaperumal at the hill by Urali pillaiar alias Irunkolan of keezhkarainadu,two and a half maanilam to the 2 deities Ranganatha and Narsimhaperumal by local feudatories valamkai Alapirandan Narasingadeva and brother

Desi Alapirandan Mummudicholackakravarthy for maintainance of the temple kitchen, gift of half maanilam at pavithramanikkam to pirathiyar of vedanayagaperumal as offering of valankai alappirandan narasingadevan ,gift of senthamangalam land by koyan Irunkolan kariyaperumal alias valankai Mikamaan ,a hunter of urali malai for maintaining the temple kitchen. These belong to 12th century AD and is precolonial. The cave temple belongs to athiyaman dynasty. 13th century inscription of Achutharaya of vijayanagara mentions his officer Savuthan Lakkaiyan renovated the temple. During the Islamic regime we find the same repeated without much disturbance to the total scheme though with little modifications .The informal management by family sangha, village sangha and the joint family system for co-operative management of daily business and industry with strong relations and alliances were not disturbed. Trust is essential for all kinds of business. The personal connections and networks through family and village relations were based on honesty and never betrayed. Support facilities as supply of credit, travel facility with protection of produce, profit sharing and apprenticeship which ensured job opportunity were part of this scheme. The immigrants were helped by local people for physical survival and in building up a career. That is how the marwaris from Rajasthan found a footing in Calcutta in 19th century. More earlier

records exist in Kerala where jews,arabs,Christians were given opportunities of survival and equal rights in trade ,commerce etc.The guilds had to keep trade and travel route secrets to “behave as a guild” and honesty ,co-operation and community feeling were key stones of trade and commerce as the Aihole inscription proclaims.

In the formal management system of the British there is no trust and it was just a contract between two parties and each suspects the other might cheat and is cautious always and wants to outwit the other and there is no scope for co-operation in such management.

Textile industry was present in Hyderabad,Mysore and Travancore-Cochin. But each had its specific resource and intensive enterprise in British India. In Hyderabad it was coal mines for the railways and tobacco manufacture. In Mysore the Kolar gold mines ,steel ,sandalwood oil and soaps. And in Travancore –Cochin tea plantations,rubber, coffee ,agricultural processing industries as coir and cashew.

The specific local communities in these princely states had their own commerce finances ,industries, agro-plantations under their politico-religious heads ,especially in Kerala where the grant of land deeds to the Christian missionaries are well preserved showing the evidence. So were the landed groups called Kanbis in Baroda. For Hyderabad and Mysore the foreign capital was not needed. Mysore had its gold fields and the foreign bullion was not needed .It was Travancore-Cochin among the southern city states which took the foreign capital. The plantation and agro processing shifted from the local chieftains to that of people who received significant foreign capital. Travancore-Cochin, Malabar economy was significantly export-oriented than other parts of India from ancient times .The factors which helped such an economy were

- 1.The long maritime experience and connections and a wide seafront and knowledge of the monsoons

2. Presence of contact with foreign world for millennia and communication during the pre-Christian and Christian era with Jews and Christians. The Christian converts established connections with the company associates and mobilized foreign exchange.

Measures of economic growth from 1891-1938:-

		1891	1921 Base	1938
Real national income	Total	70	100	126
	Percapita	78	100	82
	Agriculture	67	100	100
	Industry	-	100	175
Infrastructure	Acreage irrigated	52	100	123
	Railway mileage/percapita	51	100	110
	Postal articles handed/percapita	27	100	57
	Real value of telegraph sent per capita.	55	100	83
Employment	Factory	25	100	137
	Total	80-85	100	105-110
Foreign trade	Real export value	76	100	96
	Real import value	72	100	95
Financial development	Real value of bank deposits	29	100	100
Resources	Cultivated land millions acres	56	100	156
	Production of coal million tons	11	100	153
population		89	100	153

In older system simplest low cost anicuts on riverbeds was used to irrigate large areas and there were also suranghams for irrigation in north Malabar and wells and tanks and freshwater lakes. The canals were also used for navigation upland for trade and commerce and served a double purpose. The economic effects of the canal irrigation were

1. Famine relief by more production and supply of foodgrains by sharing through the water transport system of boats
2. Increased prosperity and security to local farmers even if rain does not come in time
3. Easy water transport for people and commodities

The high cost of canal projects due to persistent engineering defects and need for annual maintenance was a problem for the British administration in India whereas it was taken up as a mandatory duty by the people's administration of ancient traditional rulers. The swadharma became a commercial endeavour only. The canals the British built (for example the canoly canal) later became the cause for leak of saline from sea water to fresh water and whole areas of land became uncultivated (which we will see in other chapters)

Population and labour force

Death and birth rates 1881-1951.

Year	Death rate per 1000 person	Birthrate per 1000 person
1881-1891	40-2	47-9
1891-1901	38-50	46-51
1901-1911	41-4	44-8
1911-1921	42-50	45-9
1921-1931	33-8	42-8
1931-1941	30-2	43-5
1941-1951	25	40-2

Change in acerage (net sown area)per capita

Year		Acreage per capita
1885	British India excluding Burma ,including current fallow	0.69
1938	Same as above	0.67
1951	Indian union	0.81
1996	Indian union	0.38

Labour force and occupational structure 1881-1951

	1881	1901	1911	1921	1931	1951
Population million	213.2	238.1	251.9	251.2	278.7	356.6
Work force million	100.8	115.7	121.0	117.7	119.4	139.5
Participation% rate	47	49	48	47	43	39
Participation% male	63	63	62	60	58	54
Participation% female	31	33	34	33	27	23
OCCUPATIONAL STRUCTURE % WORKFORCE						
Primary sector	74	75	76	77	76	76
Sec & tertiary sectors	26	25	24	22	22	24
Industry & trade	20	16	16	15	15	-

industry	-	-	10	9	9	10
Trade & transportation	-	-	7	7	7	7
Other services	-	-	7	6	6	7

Primary sector is agriculture, animal husbandry, forestry, hunting, fishing, general labour. Industry includes mining and construction works. The quality of the labour in each sector does not depend on the mere numbers alone but on the quality of work done by each participant including his/her expertise, skill, experience and knowledge as well as the intellectual, mental and physical health status to carry out it properly and the co-operative mentality. The long term stability of women as the backbone of this dharmic structure of workforce and its retreat from the general workforce reflects the devaluation and quality to a great extent.

We have to address the unexplored aspects of rural agrarian economy and its history to find solutions for the current problems. The facts and figures are just to prove certain points. The risk of uncertainty of monsoons was not a new feature for Indian agriculturists

.The relation of agrarian economy and trade and commerce with monsoon is age-old in tropics. Still the harvest had been sufficient for sustenance and a prosperous trade and people well managed their affairs even in pre-mechanized, ancient times. No great famines reported except very few. The risks are not climatic but manmade is the first thing we should understand. The world market fluctuations and the greed to capture world markets were more responsible than the variable monsoons. What was the traditional system of insurance each village had and how did it change?

Was the rural credit system of the ancient tribals an expression of power and dominance by a few Brahmins and one or two classes? A field here creditworthiness of behavior, social power, harvest risks, portfolio choices of lenders, demand for working capital, market structure, interacted to give rise to various terms like dharma, samgachathwam, samvadathwam, panchaayathana etc (all based on collective co-operation of all and on common land property for God) was the reason for the self-reliance and self-sufficiency of village economy and its values of life. It did not depend upon any foreign capital before 19th century but derived wealth from world trade and remained self sufficient. It had shares in world economy without depending upon foreign shares for it. This is what the modern economists define a welfare state to be. And women in village agricultural and small scale industries had been an important part and had 100 % participation in all activities related to the economy of the village and the division of labour did not exclude her from any of the activities. From 1811-1971 we find this participation gradually on the decline and from 1971-1991 again gradually on the increase, but not in agriculture but all other activities.

Here it is worthwhile to quote Schultz argument (Transpiring traditional agriculture 1964) that traditional agriculture was economically rational (Ref B.R.Tomlinson. The economy of modern India 1860-1970 Cambridge university press 1998) on the following

grounds:-

- 1.The peasant farmers responded to market incentives
- 2.Optimised the use of resources when the circumstances allowed
- 3.They were held back only by the market imperfections and diminishing returns to traditional inputs so that,
- 4.In the labour market ,each laborer who wishes and who is capable of doing useful work was always employed(no problem of unemployment or underemployment)
- 5.This openly challenges the notion of underemployed surplus or unlimited labour in peasant agriculture.

How the village community made profits and how they used it/This is the crucial issue in the history of a country's agricultural development. It is defined in the terms of increase in labour productivity and an increase in labourers share of the product. In Indian rural economy the land ,labour and profit all belonged to God and therefore is common property. Everyone is doing kankarya or labour for service of God ,for service of entire village and is the dharma for next janma also. Without securing the preyas the acquisition of sreyas was not possible so the entire village did dharma for common good of all. Individual property rights were not there.

The next question is there surplus over subsistence?The answer is yes. Without surplus the ancient world trade would not have been undertaken and the ancient world gives so many exotic descriptions of prosperity of India which has been proven by archeology. It was in the wet well watered rice growing low-lying areas of the agricultural heartlands the sustained hub of traditional civilizations were well preserved .Not in the millet producing dry areas.Structured,hierarchical,urban and cultural centers these areas depended on the capital and labour intensive rural cultivation. They had high population densities .The entire farmlands were under co-operative farming and no more land reclamation was possible except at high lands.

In 1951 the rice growing state of Kerala had a population(in million)of 13.5 ,(% 3.7)in a distribution area % of 1.2.Agricultural labour as % of total agricultural population was 39.2%.Foodgrain output average from 1949-50 to 51-52 was only 684 (000 tones)which is the lowest (% of 1.3)and in 51-52 the literacy rate was 40.5%.(As per British educational standards. It is interesting to note here that in a census of the early 2000's my aunt Balamani Amma ,who is a saraswathy samman awardee and padmabhooshan due to her literary career was marked as illiterate by a primary school teacher in the census data !!).In 39-45 there was enormous stress on Indian economy and 45-52 was the crucial transition years for our young nation. The purchasing power has definitely increased and the quantity of goods of the land purchased has decreased. Volume of imported goods has increased over the years. Money supply continuing and food supply limited or slowed down .Price of basic commodities are ever increasing and distribution of foodgrains to all

at equal basis has not yet been attained. In 1946 there was a poor harvest of millets and in 1947 a poor harvest of wheat. Hoarding of food grains and increasing prices still continues. Till 1950 the Indopakistan track was standstill. Nehru was committed to socialism and secularism of the Fabien model. Patel was more traditional and followed the ancient Indian model of agriculture. Both had strong links with Gandhi but were different in their outlooks. Patel stressed the difficulty of moving a traditional society too rapidly from the traditional path and making transitions slow and steady after weighing pros and cons of each step. The followers of Nehru and Patel became the left and right wings of Congress. When Patel died in 1950 Nehru could take decisive advantage and reorganized the Government commitment as his wishes. Thus in April 1950 the national

planning commission with 7 members was formed with Nehru as chairman. The economic progress from 1951-56 was based on the plans of this body. Though a very modest plan the first five year plan was tremendous success considering the situation of India at that time. In 1950 half of the national product was supplied by the rural economy. 1953, 54 and 55 had good monsoons which with modest irrigation increased investments in production. The inflammatory prices decreased and this stimulated demand for manufactured goods. In 1954 in the chief ministers meet in national development council Nehru said: "The social and economic policy should be socially owned and controlled for benefit of society as a whole but in which there are plenty of room for private enterprise provided the main aim is kept clear".

Rate of growth of output	1950-65	1965-1972
Agriculture	5.16	1.70
Industry	7.70	3.82
National product	3.60	2.32

(Ref Walter .C.Neale and John Adams :India: The search for unity ,democracy and progress .New york 1976 table 13)

In 1950-60 co-operative societies were the most important feature of Indian economy .In 1951 4.4 million members increased to 17 million in 1961.6% share of rural credit in 1951 increased to 20 % and more in 60's.By 1971 the co-operative societies supplied a ¼ agricultural credit just over ½ as much as that supplied by the rural moneylenders.

The Ford Foundation:-

In 1959 to stimulate food production both foreign and Indian experts were organized by the Ford foundation. In April the "Report of the Indian food crisis and the steps to meet it" was published and it declared that the "food production must be made the highest priority of the Government "The first five years the Ford foundation met 1/3 rd of the cost of the project and this was called the IADP program (10 point Interim agricultural district program)and in this, the crucial problem of water management was ignored(pp 203-204 Thomlinson).Ford foundation found that with fertilizer use only marginal increase in profit was possible and it made a very crucial observation about the Indian

farmers. If convinced about the real use, the Indian farmer is as prompt as any other farmer in the world to accept motivation, and they are not conservatives as previously blamed. And the reason why they objected to the new methods of the British was not their conservative nature, but because they knew that they were inferior and did not suit their climatic and geographic conditions.

In 1961 food import from US following the Bihar famine in mid 1960. In 1962 due to border dispute with China the funds had to be diverted for defense. In 63-64 7 million went for defense funds. In January 64 Nehru breathed his last. In 1964 monsoon was good but there was a tsunami that took away the Dhanushkodi and Rameswaram. And 65,66,67 were continuous draught years. In 1965 from US 7.5 m tones of foodgrains imported. 65-66 saw the worst monsoon of the 20th century and food production fell by 27%. In 1965 there was a four month war with Pakistan. There was more dependence on outside for food. The policies become vulnerable when we are dependent on outside sources for our sustenance. Between 64-65 prices increased. Poor harvest eroded the purchasing power and lowered tax revenue and savings and pushed up the industrial costs. In 1966 Indira Gandhi as a compromise candidate rose to power. In 1967 general elections she won. In 65-66 India had taken 10 million tons of grain from US to feed her millions. In 1966 again the crops failed. This time America was less receptive to the request. President Johnson asked India to implement new economic policies that would favor private enterprises and foreign investment in agriculture. The policy of Johnson is called the USAID policy. For 10 years India took an anti-American stand but later on it pushed the Indian Government to a new path of green revolution which had already ensued in the 1960's itself.

In October 1964 there was likelihood of famine in Kerala and rigid food control came with imposition of ration (Bombay was getting ration as early as 1945-46). Throughout the scarcity period the 70% of food grains came from overseas. In 1966-67 IMF loan was taken and new American aids to fund program of capital investment in intensive agricultural techniques was launched. In return Indian Government had to devalue the rupee, liberalize import control regimes and allow foreign firms to invest in fertilizers. HYV of new foodgrain seeds did not thrive well and the farmers had to shift back to older variety of traditional seeds. At the beginning of 1970 the green revolution of India was actually a wheat revolution worked only in Punjab, Haryana and west UP. In 1972 prices rose and in Gujarat and Bihar there were protest movements. In 1975 emergency was declared.

In 1966 Indira Gandhi had disbanded the planning commission and constituted the national development council of the state Governments. They were given block loans and grants so that they can freely develop their own states. (An attempt for decentralization was done by her). The principle was on the fact that the local problems, priorities, potentials, and past experiences are known better for the rural sectors and through them to the state Government. In 1969 the great split in congress happened. In 1971 Indira Gandhi won and in 1972 Bangladesh liberation and a crushing victory were the initiatives for forcing states to implement distributive land reforms.

From 1970-80 the application of new technologies increased. Investments in agriculture

increased and food grain self sufficiency was the goal. The real price of wheat and rice came down. Employment in urban construction sites increased and people moved from rural to urban centers in search of labour. People migrated to informal service sectors and to the overseas (mainly Gulf) and the rural agricultural labour market tightened. Therefore self-sufficiency became possible only on an operation holding of around 2.5 acres in some parts. Increased interurban migration, increase in local wages, electrical, mechanical and chemical foreign collaborative joint venture sectors were features of this period. Thus what changes the British had started were complete by about 1970's in India and especially in rice growing rural areas of Kerala, predominantly in our study area, Malabar. This we have to see in a broad national and world basis not as a local phenomenon alone.

How Indian economy changed?

From the end of the 18th century three overlapping waves of change transcending patterns of production and consumption happened in India.

1. Rise of colonial rule which changed the existing rules and regulations of the nation to change the economy

2. Extension of market economy over food production

3. Modern economy based on machinery and waged labour.

By 1947, when we got independence India was one of the poorest countries in the entire world.

1757-1856

East India company annexed territories. The 1856 annexation of Oudh happened. 60 % of land (present India, Pakistan and Bangladesh) belonged to Oudh. In 1857 the great Indian mutiny or first war of Indian independence happened. Close control of princely states without annexation was called the indirect rule.

From 1850

The market economy gained momentum. The whole world including India was the supplier of the food and raw materials to industrializing Europe. This gave opportunities for trade and commerce and product for export increased. The rough measure of commercialization is the annual growth of foreign trade. From 1835 upto world war 1 this increased.

The ancient weights and measures of India famous even during the Indus valley period was changed to the British systems. The railways, telegraphs, all public communication channels were under the Government and the natives lost all control of their old systems

and the private property system introduced weakened the co-operative guild systems of trade, commerce and agriculture. The taxation system changed and the regional co-operative systems had no power to take any decisions in the favor of the people.

From an economist's point of view market economy as a new policy and the monetary system instead of the barter in kind and service is a quick action. But historically the slowly acting forces of their effects had ruined the best co-operative commune systems existed in the whole world from antiquity. The analogy is to that of human body. Our body responds quickly to a chemical as a medicine and we get quick but temporary relief only. Side effects of the chemical comes later. For long term effective measures it is better to develop good immunity, by lifestyles, by harmonious relation to our environment and genetic traits. The quality environments, the population, the cultural and mental make up, the scientific and technological know-how related to the regional climatic and weather conditions, and industrial organization based on a agrarian economy is the better type of economy as far as India is concerned.

In 1776 Adam Smith wrote that the key to economic success is the productivity of labour. Increase the quantity that each individual produce to increase the average consumption and income. How does the productivity grow? If an individual concentrates on one labour (specialization in one work) instead of wasting energy in different things, the products will be both quantitatively and qualitatively good. (Division of labour and specialization by the varna in India was based on this). Each discover the easier and readier methods for production of each. Market increases and surplus also increases and more and more specialized they become in the respective sphere of activity. The markets become more competitive and even distant nations become dependent on the quality products from such artisans. That is how Babylonians, Assyrians, Egyptians, Arabs, Greeks and Jews and Romans and later Portuguese, French, Danish and British became interested in Indian products and markets and came here.

In 1969 John Hicks developed a view of European history as expansion and maturation of markets like

1 products

2. And factors of production (land and labour) by social systems and political power.

He said commerce, competition and competence are interdependent and the control of colonies by colonizers is justified by that. But trade and commerce were done with competence, and with competition between the richness and quantity and quality of each one's product in India and competition was on efficiency and not on destruction of others. This basic change in the attitude happened with British supremacy.

India had fertile lands, plenty of rainfall in many of its areas, rivers for people and agriculture and plenty of labour force which acted co-operatively for millions of years. It was making surplus food for all and also creating world markets through organized land and sea routes and administrative rules for protection and sustenance of all economic

activities. A country takes time to grow rich and prosperous and takes times to remain rich for millennia. Such a country crumbling to poverty within 300 years of foreign rule was unique in world history. Then such a poor country getting independence and staggering back to its strength and competence by 64 years is also a unique feature in history. The economic exploitation by trade, hoarding and investment by individuals and concentration of political power in inefficient hands was checked by the older system and this was broken down in the 300 years and we haven't been successful to get those ideals back. The scholarly traditions of the west which deals with the question of why the west grew rich, ignore the complementary question why the east and southeast remained poor after the rise of the west.

Marxist and the world system approaches:-

1. Ignore the local/regional peculiarities and apply the conditions of the west to the east and theorize
2. The west grew rich by exploiting the non-west and this is either ignored or forgotten. The west learnt the science of agrarian economy, and industries and philosophical, medical and astronomical knowledge from east and developed them in their own rights and weakened these systems in the countries from where they learnt it.
3. The view of trade is unrealistic and lack a tendency of co-operation and is based on exploitation of the neighbor
4. Identification problems.

Low wages can mean either an abundance of labour so that wages when distributed among all becomes less, or even a political weakness of labour. What they consider as unequal political power is a relative society or abundance of different factors of productions based on geography of land and this was brought under the sharing principle of co-operation. When this principle was weakened people could not help each other, could not share anything with each other and every one lost faith in the other. Every one became a potential enemy when individual property rights were introduced and co-operative efforts negated.

The theory of Adam Smith and of Marx failed in India and even caused problems in Indian economy. This is the 19th century left Nationalist paradigm articulated by R.C.Dutt and Dada bhai Navroji. It is built around two beliefs.

1. The decline outweighed the growth
2. The decline of growth viewed from colonial position alone.

The colonial rule demanded cash revenue. Forced peasants to increase cash crops than the subsistence crops. This increased risk of famine. The peasants fell to constant debts. They were forced to sell or mortgage land to moneylenders. They became mere laborers and

tenants. Money lenders were not interested in investing money or profits in improving land quality or its productivity. The agricultural stagnation was precipitated leading to rural poverty and hunger and inequality. Import of British manufactured products destroyed the traditional industries and handicrafts and this added to the number of agricultural labourers. India's position as a leading quality manufacturer declined. In 1750 1/4th of entire manufacture output of the world was supplied by India. By 1900 it became as little as 1.7 %. In large scale industries, the British capitalists were competing with Indian capitalists. British Government supervised a transfer of wealth from India to Britain which the nationalists called the "drain". Foreign business in India created limited income or wealth within India. Modern infrastructure built by the British for purpose of transporting Indian wealth abroad had little impact on traditional economy of India and Indian society. The ancient traditional routes of trade and its protectors were destroyed by the new rulers.

In the 1950's the left nationalist paradigm saw pre-colonial rural India as a cluster of self-sustaining village communities oriented to subsistence and production (peasants and artisans). And there was no class of agricultural labourers in it. All were agriculturists or artisans who shared their produce mutually and co-operatively and lived peacefully. How to create such an ideal situation or revive such an economy and improve long distance domestic trade and international trade was the problem of the young nation when it started its independent rule.

Subsistence production for entire population with surplus for years of famines :-

This requires co-operative farming techniques, increased production techniques and education about the regional peculiarities of agriculture and its benefits. If there is a failure one should know whether it is due to market failure, crop failure or Government failure and take suitable measures.

The resource or the agricultural land and the weather conditions being the same for the Indian subcontinent from antiquity to date, what we want to revive was the co-operative spirit and increased production by different methods.

In the 19th century the peasant problem of scarcity of water and floods lead to irrigation schemes, canals, tanks, wells. This was done by successive rulers/chieftains/kings from time immemorial and was not a new thing for India. But if the land is not fertile and if there is a population density which is very high such measures can be futile. In south west and eastern parts where there is arable land investments in irrigation decreased and production or growth decreased due to this reason in 1920. The population growth rate increasing rapidly, intensifying shortage of land and food for all was another problem. 19th century India had plenty of labour, cheap natural resources but no capital in the form of money as such. Therefore the moneylender class /capitalist class emerged slowly. Till then there had been no capitalist economy in India. Because entire land belonged to God, and only trusteeship rights existed for people, even for the rulers. The inadequate Government investments in water resources by the British as against the previous system of rulers further decreased agricultural productivity of land. From 1750 the old traditional systems were crumbling and new regimes were raising after decline of the Mughal and

Vijayanagara dynasties. These new regimes were famous for the armed conflicts which did not spare civilian life and agriculture and the treasuries and granaries of the village people being in the temples in the center of fields, they were attacked. Depopulation of the areas, decline in agriculture mass migration happened in many parts of India (ch 2 Economic history of India 1857-1947. Thirthankar Roy Oxford university press 2000). In fact my mother's family migrated from the banks of river Choorni in Alwaye to banks of river Nila in Thirunavaya and thence to Punnayurkulam in 1750 when Tipu Sultan invaded Cochin state with help of Zamorin of Calicut.

Even with all odds India escaped from becoming a desert due to its rivers, monsoon rains and wetlands which allow one to three crops of food grains a year. Hence the area selected for study is very important which has all the three factors of protection for Malabar coast. The agricultural and irrigation facility for the kaaninilam of our family was very good which I remember from my childhood and is redrawn here from the memory. Now only the small tank and well remain and the canal system is gone forever. (Figure) Each family had a kaaninilam (the field which is directly seen in front of every house) with a canal system of irrigation, from bigger or smaller tanks and wells and even facility to lift water by oxen (kaalaathekkku) or by basket (kottathekkku) manually by two people. The Nalapat kaaninilam was connected by a system of canals to the big chira (lake) of the ruling family of the village (Eliyanghat / Mooshakavansa) on the east and this was interconnected to the tank of Nalapat family on the southeast of the house and the bigger deep kokkarini (big tank) on the west which had kottathekkku facility in dry seasons. The excess rain water in the tanks were reaching the kokkarini and stored there for use in dry seasons. This system of canals always kept the land fertile.

The pancha was always cultivated by co-operative basis and all the villages in the entire area participated in the maintenance of the system of canals and the help was provided by Cochin and Zamorin Rajas, since the area of kol pancha extends in these Raja's areas and though they were rivals for supremacy, they did the bund construction together on a co-operative basis. (Still that old bund is used by the kol agricultural farmers). The systems of water storage, reservoirs and distribution for multipurpose was a very important feature of agrarian economy of villages. Now this system of canals, tanks, wells, and fields are being lost for construction works and the ecology is changed and disturbed.

In agrarian relations janmam rights were the land rights. It was connected with the birth rights given with a neerattipattu (given with water and a honest truthful deal) by the geopolitical head and the religious head as representative of God on condition that the receiver of the land will produce good grains and keep the land fertile. It was not permanent for anyone who does not do this, including the ruler himself. Rotation of the heirs from the ruling family in 12 years was based on this and they had to prove their efficiency as administrator, producer of the land allotted to them as well as superiority of defense abilities. Right of revenue collection which is the right and obligation concerning the state was related to the janma property. The janma rights of the matriarchal family was only for the women of the lineage and the men were only trustees who looked after the sister's property for the next generation of nephews and nieces (both royal families and Nair families had this system, which is comparable to the ancient system of the

Egyptian Pharaoh). A massive pyramid of revenue leasing and collection from the emperor at the top to the village chief at the bottom was functional from ancient to pre-British times in India and for some years into the British rule. When the authority and relationship of people and their chieftain weakened certain tiers leased out the land by auction to highest bidders and this was called revenue farming and this created problems for the old janmam villagers. If a new area is a new acquisition, the local officer's loyalty to the new right holder was important for them. These rights were not hereditary but by prolonged practice, experience and speculation, the successors had and could become the rulers/chieftains/agricultural heirs. This was the practice not only in Kerala but also in Bengal, Ayodhya, etc where the Talukdars were members of the old weakened dynasties and their smaller branches. Therefore the revenue collection was the same for several generations and no one had asked for excess revenue or evicted the old tenants. They were doing revenue collection, held hereditary positions in courts, and were supplying troops from the people for the new nawabs of the Mughal dynasties etc also. In 18th century the British were suspicious of the loyalty of them and the revenue farming had already weakened their power and they were political nonentities but the people still considered them as their protectors. Therefore British appointed new tax collectors and people to watch the old chieftains who were helping the tax collecting British officials. None of their previous duties or rights existed. They were just obeying orders from the bureaucratic new Government the ways of which were totally different from what they were used to practice. The revolutions led by Pazhassiraja or Veluthampi Dalawa were protests to such systems of ruling. In places where there was no leadership the people thought their old rulers are responsible for the entire system and rose in revolt against them. Some of the old chieftains revolted and got killed. Others succumbed and obeyed and by that became rich. The warrior class of Andhra was called Poligar by British and Thalukdar in Gujarat, and in southwest as Mirazdars by both mughals and British. And the janmi in Kerala. They were really substantial cultivators who claimed descend from an original settler family or lineage. Mirazi rights were saleable in some areas only, where the land was not fertile like the north west. Mirazdar can lease land to tenants. The tenants in those areas were a minority.

The farmers were the hereditary owners with kaanam rights. Those without janmam rights doing tillage of the land were called the uzhar (T. Ray Choudhary. The middle eighteenth century background in Cambridge economic history of India 2) and the Chera king is often called the uzhar in sangham literature. Uzhar existed only in areas where the land had to be tilled with a plough like Tamil Nadu and Kerala. In other areas where a slash and burn agriculture was preferred they were not present. The presence of them in low-lying wetlands was because of the need for co-operative farming in wide fields. The tenants whose rights to cultivate or occupancy rights were hereditary, and transferable in different degrees and was not like the property rights of the modern times where one can sell transfer or gift (bequest) and mortgage one's property as one pleases. Even the king did not have that right in pre-British times because the land belonged to God and therefore to entire village alike. Each individual can get a piece of land to cultivate, to produce and to eat and live and make profits by having produce and it was prospering together that was the basis of the rights. When one produces more, gives more and shares more for prolonged periods with honesty and truth, the janma becomes hereditary and permanent and even

then the individual incentive of the entire family existed to become the chief of the family. The joint families and their kulasangha (guilds of joint families) did joint farming and they were given revenue-free farming. This was called the temple lands in sangham period and inam lands later during the Muslim rule. In fertile gangetic plains of the east also this existed. The prosperity of their land depended upon the amount, fertility of land, on the strength of their organization to work co-operatively and thus increase production and the surplus they produced to share and trade with others. The low land-man ratio, the high population density area decreased their hold. When the British introduced the Seminary system their position was jeopardized. In Ranajit Guha's Subaltern studies 11 Goutham Bhadra (Two Frontier uprisings in Mughal India pp43-59 Oxford India paperbacks. OUP 1999) points out the uprising of the Tribals against Jehangir and his rule in Kuch Bihar and Assam border when king of Kuch Bihar and Kamarup were deported by Mughals and the daughters and sons of the people and royalty were taken away by soldiers. Their chief was Sanatana Kuch chief of Paiks. Sanatan in a letter to the Mughal chief's request for peace said because of Mughal oppression the Ra'yas (cultivators) have no capacity to pay revenue and two of our great princes have paid lakhs and crores of Rupees and have surrendered to Mughals. This revolt has started in Khuntaghat, in south bank of Brahmaputhra in the present district of Goalpara in 1614 AD well before the British became rulers. In 1621 the second uprising in Khuntaghat was the Hathikheda revolt. Palis gave services for capturing elephants and auxiliary footmen (gharduwari paiks) drove them to the enclosure where palis kept them. The ryots who worked on the fields used to do the work when there is no work on the fields. But Mughal army sent them for catching elephants when there was work in lands and their farming suffered. Moreover when some of the elephants escaped the palis and paiks were ordered to bring back them or pay Rs 1000 for each elephant. The hilltribes proclaimed the elephant headman as their king and killed entire army and confiscated all elephants of the emperor. It was not a Hindu versus Muslim rebellion because Balabhadra the Divan of Mirza Nathan was the tyrant who was strongly opposed by Bhaba Singh a Kutch noble and brother of Raja Parikshith Narayan who had earlier been deported by Mughals. The fact is that the revolt was by ordinary people belonging to lower strata of society, a group of Machwagiri or fishermen who had built a fort over Goalpara. That means all the chiefs were not from upper caste and all the forts were not built by upper castes and the revolts had a basis on whether the land and its products and also the dignity of its sons and daughters were touched. These happened even before British rule and much before Pazhassi Revolt of Kerala which has a similar background. Paiks were peasants who worked as soldiers and armed retainers also. In return for service in army they are given arable land free of revenue and the land is called Paikan or Chakran. The labour was revenue so that the peasants need not pay any tax. Receiving land in return for military and other services was custom. Land was given to 140 families in Kuch Bihar who were votaries of a common temple, among them most important being blacksmiths, weavers, messengers, panegyrist etc. Even during Shah Jahan reign we find these people being given jagirs. The soldiers are paiks, the land for their livelihood is paikan, and they were also doing service in capturing and driving elephants (Abdul Hamid Lahori, Padshah Namah ed Moulavi Kabiruddin, Moulavi Abdur Rahim Bibliotheca Indica vol 11 Calcutta 1867-8 pp 71 Q pp 51 ibid) From every house 1 out of three people were taken to services of the king as soldier. Each family is a Gote (Gothra?) and

by rotation each of the 4 members of a gothra becomes a paik or soldier and the other three does the other jobs like looking after farms, and other activities. In Pre-Mughal days of King NarNarayan this Paikhan system was established in Assam. Each soldier was given 12 Bighas of land for cultivation. The Kari among the people were considered inferior with lesser privileges and Chamuas were skilled artisans and they need not go to war and had more privileges. Kari could enter the soldier group and higher status but were still considered lower in status. That is the difference between Kari and Chamua is that the Chamua need not pay labour service and were more like the Bhadrak of Bengal. They were more involved with arts, sciences and administrative role. The situation is comparable to Kari of the Sangham period in Tamil literature and the Sami or Samana people (who later became the Brahmins). The Panchajana concept of the Vedic people and the importance of the village economy based on this persisted till Independence at least in some places of India without interruption.

South India had joint land lordship with distinct and important roles of offices of states located in or near the village. Two offices which were critical and universal were the headman (janmi/mooppil) and the accountant (kanakkaayaan/aasaan/guru). Revenue collection, keeping accounts of land, investments in agriculture, like irrigation, co-operative farming facilitation are their duties.

The uniform tax which British insisted on all cultivators of British India was not practicable simply because of the different climatic and geographic conditions, different fertility and productivity and crop systems and therefore it was a regressive system. When the Government took away the entire surplus the market for mass consumption goods was severely restricted. Subsistence consumption was from the village collage industry and that too was taken away and the slash and burn cultivation was prevented by law and people were denied access to forests for their sustenance food from there by the forest laws. Thus the people were starving and when a famine came there were no stores for them to survive and the Government did not know what to do.

How was the revenue share in produce managed by the earlier villages? It was used for village administration and consumption needs of the villagers during times of need like natural calamities and for the consumption needs of the non-agriculturist families of the village who do kashakam or vaaram for the village, and the artisan class. These included several groups from the chaamar to the village accountant and the warriors who guarded the passages of land transport in mountain passes etc. The aasaan or teacher and the king also were given wages out of it. Temple administration, education of village, and accountancy services for village and the revenue staff and warrior class of defense were all paid with this. When British insisted on cash the people had to sell it at low prices and give entire amount to the British. The old transport route defenders called kallars and the people of the mountains and forests had lost their jobs, their shifting cultivation practices and even the access to forest products. The rural profits from raw cotton, raw silks, indigo, sugar, salt and saltpeter trade were blocked by the mercenary trade of the new ruling class. The entire sustenance, revenue, barter, sharing and customary system of living was upset. The network of transport by pack bullock carts and boats and ships to distant lands were under the British so that they could not carry out their trade which they

were doing for millions of years without any obstruction and people did not know what was happening to them. The share of crop as revenue was a kind of insurance the people had against famine offered by the temple and big landlords/chieftains to both the cultivators and artisans and also to themselves when the crop fails. This was lost. The pre-colonial exchange of crops and forest produce was for labour, manufacture and also for surplus production for sale. This varied between regions especially in rice and wheat producing areas. By 1750 the system weakened. The janmani system introduced by British and accepted later by nationalist Government with an intention of making the village integrated, self-sufficient, egalitarian made it also commercial and opposite of what was intended. Egalitarian was a myth since inequality has increased over the years. The poor have become rich, one may argue but the rich has become too rich keeping the ratio and gap deep.

The village economy of agricultural India depended on barter, customary dues, production of manufacture for local consumption, and for distant trade, specialization in each craft/job later called by the British as caste system of India and this system crumbled in 19th century by the abovementioned policies.

What were the village industries ?

These were done by collective specialized artisan families who were either part-time cultivators or fulltime artisans. Textiles of coarse and fine cotton and silk, pottery, weaving mats, agricultural implements of wood and iron, sugar called chakkara (from which the word saccharin was coined in English language), leather, oil, gold and silver works, salt, saltpeter, indigo and alloy metals were done by part-time and fulltime artisans and widely traded. Ivory, musical instruments, toys, spices, medicines and herbs and mats and baskets of reed and palm leaves were prevalent. The crafts were protected as agriculture in two ways .

1. consumption/markets

2. from piracy

High quality goods were met with high rewards and incentives. The karakkana or karkkana (factory of handicrafts) existed in India from antiquity. The guild of such people worked and moved as a gana or kulasangha and each branch settled in a neighboring village so that every one can have an assured number of customers and they had an endogamous breeding system to protect the races. The place for the artisan family was specified in each village alike. (A general lay out of plan for village and town existed). In the west and east coast shipbuilding was an extra industry.

MODERN INDIA

Ecological interaction of people and environment

History seeks to understand human beings as they have lived ,worked, and thought in relation to rest of the world and nature through changes brought about by time. American environmental historian William Cronon said history must make ecological sense .(J.Donald Hughes .What is environmental history? Polity press .Cambridge UK and Malden USA 2006)And Thucydides had opined that history is politics and could be studied in the present ,not in the past.(The use and abuse of history .Finlay .M.I. Ed Pimlico 2000).Study of any discipline whether it be history,philosophy,numerical science, calculus as differential equations or a language like Sanskrit needs effort and application in life. If there is differential equations in a book ,a student who does not know calculus will not be able to comprehend it. That is, study of a special discipline needs the prerequisite of study of certain other things. If one has to understand the economical and ecological political agrarian India of the present and lead it to a better future ,the prerequisite is an understanding of its past .

The genealogy is the most popular pursuit in the internet at present (the other two being personal finance and pornography showing the interest of the majority in worldly pursuits of wealth and sex or artha and kaama) and is better than the other two interests.(Who do you think you are? The essential guide to tracing your family history. Dan Waddell .2004)Meera Syal found that her family records were kept faithfully in a small village temple in Lasara in Punjab ,N.W.India.This is a practice done in temples of holy cities around India according to the author. In Haridwar on banks of Ganga the genealogy of Syal family is kept in a book called the Bahi by a priest and she got it from them and it had a 250 year old family tree. The names to the tree are added when the members die by the priest. Therefore the long lists of genealogy kept by great Kula guru /priests like Vyasa /Vasishta /Gargya and their Gurukula for ages ,of the Chandravansi/Sooryavansi/ Yadava kings is not myth but chronological history.

When we study history of a small village we have to understand the spatial and temporal scales (modified from Dincauze 2000). Spatial and temporal scales (Environmental archeology. Theoretical and practical approaches. Nick Branch, Mathew Canti,Peter Calaer,Chris Turney .Publishers Hodden Arnold 2005).

Here applying this to Punnayurkulam ,our study area we have :

SPATIAL	Area(Km)	Spatial unit
Mega	5.1×10^8 $<10^8$	Earth East hemisphere, Asian continent
Macro	10^4 - 10^7	Region, major physiographic unit. India
Meso	10^2 - 10^4 1- 10^2	Subregion .South India. Locality Kerala
Micro	,<1	Activity area .Kolpuncha of Punnayurkulam

TEMPORAL	DURATION(YRS)	TEMPORAL UNIT
Mega	<1 million	Evolution of plants and animals
Macro	10000-1 million	Glacial antiglacial biomic changes
Meso-	100-10000	Vegetation migration
Micro	<1-100	Woodland clearence

Thus we are studying the spatiotemporal environmment of Kol puncha of Punnayurkulam which is a meso environment spatially and a meso to macro environment temporally from available literature studies. Evolutionary continuum of people plant interaction (Modified from Harris & G.C.Hillman ed.Foraging and farming ,the evolution of plant domestication. 11-26 London.Unwin Hyman.):-

PLANT EXPLOITATION ACTIVITY	ECOLOGICAL EFFECT	FOODYIELDING SYSTEM
Burning vegetation	1Reduction of competition, 2Acclerated recycling of mineral nutrients 3 Stimulation of asexual reproduction 4 Selection for animal or ephemeral habit 5 Synchronization of footing	Wild plant procuring (Foraging)
Gathering and collecting	Casual dispersal of piropagules	Same as above
Protective tending	1 Reduction of competition 2 Local soil disturbances	Same as above
Replacement planting /sowing	Maintainance of plant population in the wild	Wild plant production with minimum tillage
Transplanting and sowing	Dispersal of piropagules to new habitats	Same as above
Weeding	Reduction of competition Soil modification	Same as above
Harvesting	Selection of dispersal mechanism (both +ve and – ve)	Same as above
Storage	Selection and redistribution of propagules	Same as above
Drainage,irrigation	Enhance productivity Soil modification	Same as above
Land clearence	Transformation of vegetation,composition and	Cultivation with systematic tillage

	structure	
Systematic soil tillage	Modify soil texture, structure and fertility	Same as above
Domestication	Propagation of genotypic and phenotypic variants	Agriculture(farming)
Cultivars	Cultivation of domesticated crops	Evolutionary differentiation of agricultural system.

With these ,the socioeconomic trends happen in time as follows:

- 1.Increasing sedentary/settled life ,settlement size, density and duration of occupation
- 2.Increasing population density ,locally, regionally and continentally
- 3.Increasing social complexity like ranking and stratifications in society and formation of state .

All these are stage by stage processes and all the tasks are conducted in all stages by different people of the Indian population ,even today. In sequence of stages reduction in wild food procurement ,and expansion of agricultural activities happen. In South East Asia the wild food securement stage is from 12000-10000 yrs ago. Domestication of plants and animals 10000 yrs ago.

From the chronology Vyasa and Valmiki gives and the information obtained from the Vedic literature we can say that Indians have been using agriculture,irrigation,ploughing and domestication of crops, animals and their cross-breeding as well as selection of women and men for better seeds and kshethra for better children (purity of race)at the same time allowing cross breeding in all races to form mixture of races. And the time span from chronology appears as equal to or even before that .Because the gene of the endogamously breeding Perumal kallar of Tamil Naadu is 50000-70000 yrs according to genetic studies and this is the tertiary epoch before Pleistocene .(before end of last glacial stage in N Europe when Europe was only a sheet of ice.)

Epochs and geological periods :

Time (yrs BP)	Epoch	Geological period
0-3000	Modern historical	
3000-10000	Holocene	Quaternary
10000-14000	Pleistocene	Quaternary
14000-1.7 million	Tertiary	Archeologically upper, middle and lower Paleolithic

Time yrs BP	N America	S America	SEEurope Greece	SEurope, Italy, France	NEurope Britain	Env.Ch N.Europe

0		inca				
1000	Maize				Roman	
2000			Classical pd Grece	Rome	Iron	
3000	Sunflo we				Late bronze	Climatic deteriorati on
4000	Sunflo we					
5000			Aegean,early bronze	Cu age,mixed farming	Early cultivers,mi xed farming	Lime decline
6000	Archaic					Elms decline
7000		Maize			Early neolithic farming	
8000						Climatic optimum
9000			Early mechanized farming	Early Neolithic foraging&mi xed farming		
10000					Mesolithic	Mesolithic
11000						
12000						End of last ice age
13000						
40000						
1.7milli on						

In Sanskrit Okam means a household or a closed community or a private space.From this is the Greek word Oikos meaning a household.And ecology is derived from this.

Feeding habits of animals and feeds make them into definite classes (nontaxonomic subdivision).

plant	Animal
Autotrophic(photosynthesis)	Heterotrophic feeds on plants and animals
Xerophytes	Herbivore
Hydrophytes	Carnivore
Mesophytes	Omnivore
	Saprophytes
	Parasites

Major world Biomes(Simmons 1979) is modified here :-

Tropical rain forest	High, and constant temp & humidity. high biodiversity. Low lands .South eastasia, S.America, Mesoamerica, parts of India (including Kerala)
Tropical seasonal forests	Pronounced wet and dry seasons. Productivity less than the rain forest. India, SE Asia, North Australia.
Tropical savanna	One dry season .Grass land dominate. Africa, Australia, S America
Temperate sclerophyll woodland and scrub	Warm dry summer, cool wet winter, trees ,shrubs dominate, SE & SW Australia ,Mediterranean basin ,California ,Chile.
Temperate greenland	Low rainfall, N America, Asian steppe, Africa, S America
Deserts	Low rainfall low biodiversity. high adaptation. Chile, California, SW America African Sahara ,Middle east
Deciduous forests of temperate climate	Pronounced hot and cold seasons. average rainfall. western, & central Europe, NE America
Boreal forests	Long cold winter. Evergreen forests N Eurasia, N America, Himalayas
Tundra	Low temp & rainfall. dominated by low shrubs grasslands. Central Alaska ,Greenland
Mondane (mountains)	Complex altitudinal and latitudinal variation in climate. highly adapted biological life
Islands	
Seas and freshwater	

A simplified model of ecosystem:-

ABIOTIC COMPONENT Geology Soil Climate	ABIOTIC FACTORS Salinity Precipitation Temperature Competition Predation Succession
Plants Animals Human beings	BIOTIC FACTORS

BIOTIC COMPONENT	
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In Northern Mediterranean (Southern Europe which includes Rome, France, Spain) in 7000 BP farming was introduced and animal husbandry. Wheat, legumes, barley were grown. Sheep and goat domesticated. And people were hunters. Who introduced farming and animal husbandry? The four main models proposed are

1. Maritime colonists.
2. Colonists who introduced indigenous population to adopt farming
3. Exchange among indigenous foragers
4. Domestication by indigenous people.

At coastal cave of Italy (Arene Candide) c. 8000 years coniferous and deciduous trees for animal fodder existed. Utilisation of cereal was human activity. And Rome was built in 2000 BP.

In Americas 10600-7700 BP agriculture existed. But Europe did not even have an idea of such a place in that remote time. Who introduced agriculture there? In Thames river area 11500-6300 BP wild plants, hazel nuts, acorns and first sign of human occupation.

8000-3000 BP farming communities

6300-4100 BP, Neolithic culture. domestication of plants, animals shifting cultivation woodland clearance and cereal cultivation

5000-3500 BP woodlands decline.

M Ancient Mesopotamia:- Between Euphrates and Tigris which originate in Taurus mountains of Armenia, flow southeast and at Basra join to form a waterway which continues down to Persian Gulf. Northern part is cliffs. Southern part broad alluvial plains capable of food production. The Ubaid period was from 4500-3500 BC, Uruk period from 3500-2900, Early dynastic from 2900-2370. In 3000 BC urban centers of Uruk, Mari, etc connected by river transport. The Sumerian grain traded for semiprecious stones of Iran. Wheat, barley in southern plains. Meat and fish staple diet. Eridu (4000 BC) irrigated agriculture. Simple local systems of irrigation, canals depressions, back slopes etc. Uruk period had canal bunds. The administration was concerned with de-silting and reservoir construction. Since silt obstructed canals regular cleaning of canals needed.

Early dynastic (presargonic) period show a regulator with 648 000 brick and 265000 liters of bitumen. In Larsa royal inscription is seen that "I fashioned the canals". The need for irrigation and canal building was the reason for rise of the Sumerian state (Kramer

S.N.The Sumerians .Chicago uty press 963 pp 5).

When there is increase in scale of irrigation, the danger of increase in soil salinity increases. To overcome this by drainage to the sea, or allowing periods fallow in which wild plants growth and rain water leaching gradually reduce salt content of top soil rendering it suitable for crops again. The fallowing system is widely understood and insisted on by modern rural villagers also (Jacobson in Gibson .1974.Irrigation's impact on society.7-20 Tucson uty of Arizona press Gibson.M)A balance have to be achieved between salinity of irrigation water ,the amount used ,and the depth of the water table. In early dynastic times salinity problems in fields owned by the temple at Girsu existed. Similar records through Akkadian and Ur 111 periods seen as curse against trespassers on boundary stones. The divine intervention was considered a factor. The field decreased its yields Repulsed the grains For being black, the tilth turned white The broad plain gave birth to wet salt The womb of earth revolted No plants came up, the ewe conceived not Salination affected Southern Iraq in three phases. The most serious was between BC 2700-1700.Which lead to shift of power from southern to central Iraq despite of Euphrateswater between neighbouring cities of Girsu and Uruma. Entemenak,Girsu's ruler constructed a canal to get independent water from Tigris.The more irrigation to west of Girsu and salination increased.Overall decline in productivity around 2400BC.Shift from wheat to saltresistant barley ,southern plain declined political importance ,leadership passed on to rise of Babylon by 1800 BC .This is an example of salinity affecting the political power. Governance became more centralized and large schemes on irrigation works followed. Taxation increased. Small scale local producers replaced by larger landholders often absentees. This process affected the salination by reducing implementation of vit fallow period in which saline soils could recover from high water table induced by irrigation and salts could be leached out.Salinisation is a local phenomenon. It changed the wheat-goat economy to barley-sheep type as irrigation progressed and with rise in population. The well drained areas became complex societies .More marginal soils became zones of shifting cultivation barely keeping ahead of the environmental destruction. Overuse or misuse of natural resources thus brought about the destruction of a civilization by itself. In the case of Australia and North America, in New Zealand by arrival of Europeans and in Galapagos by arrival of Darwin there was destruction of fauna and flora and it was manmade.

Herodotus had spoken about Turkey .Herodotus was a Greek and a carian.Who is a carian?The most famous of all nations due to their military service to the semi mythical demigod Minos of Crete whose conquests spanned the Aegean. But he didn't know much about the legislative measures of Minoas to control population. But Aristotle knew it. Herodotus said Cariaans were islanders driven out by Dorians and Ionians and forced to resettle. He mentioned the expatriate Carians of Egypt cutting their foreheads during festival of Isis showing that they were foreigners and not Egyptians. They served in various armies and revolted against Darius.In 7thcentury BC they were given lands in Egypt by pharaoh .

In 1983 a shipwreck from 130 mile south of Bodrum showed that it was from 1310 BC

which was 1000 yrs before Herodotus. It contained the treasures from Mycenaean, Canaanite, Cypriot, Egyptian, Kassites, Nubian, and Assyrian civilization nothing to say about Indian. 354 ingots of 10 tons of copper, one ton tin ingot, which could make bronze for an entire army, one ton yellow resin, to burn as incense stored in 150 Canaanite amphorae, 175 ingots of glass, cobalt, turquoise, lavender, logs of Egyptian ebony, ostrich shells, elephant tusks, hippopotamus teeth, musical instruments of tortoise shells, Cypriot ceramics, stylized drinking cups in shape of Ram's heads, copper caldrons, bowls, women's jewellery of gold pendants, medallions, bearing images of falcon, hooded cobra, fertility figures, silver bangles, rings of shells inlaid with glass, signet rings of electrum, agate beads, carnelian, quartz, faience, ostrich eggshells, gold ring with scarab setting, tiffany diamond necklace, fabulous gold scarab exactly like the one seen on Nefertiti, the beautiful wife of 18th dynasty Pharaoh Akhenaten, tin and bronze figurines, a golden chalice, duck-shaped ivory cosmetic containers, bronze awls, drills, chisels, axes, saws, and the crew (the bronze age Phoenicians) fished from boat using nets and needles to repair nets and even a bronze trident was seen in the shipwreck. Bronze spearheads, arrowheads, swords and daggers were in plenty. This was the nature of the bronze age international trade. On anticlockwise circular trade route, sailing northwest

from Canaanite Syria, and Palestine to Cyprus, then to Aegean, and back sometimes far west Italy and Sardinia via North Africa and Egypt. There were fragments of three wooden folding writing boards (diptychs) with a layer of beeswax to scribble on with stylus. It had corner ivory hinges. It was what probably Homer wrote about: -He sent to him to Lycia and gave him baneful signs on a wooden writing tablet. (Iliad, book 6). Another Phoenician shipwreck of 1200 BC was then discovered under 90 feet of water. Followed by 10-20 late bronze age wrecks every year. Homer had mentioned Phoenician sailors as metalsmiths and its antiquity was thought to be that of 800 BC before the discovery. That trend changed and the thought that trade was a Mycenaean monopoly also changed. Mycenians never went around Aegean. They did not have international trade. The two-way trade was suggested by the manufactured goods of copper, gold, tin and ivory from near east to the west. And the writing table of wood existed in 1300-1400 BC and peaceful relations through trade and not through power politics existed in a well organized manner. Halicarnassus was the Greek city of Persian empire in a distant corner. And Bodrum was a fishing village of 5000 population and everyone knew the others. Sumer had 10000 population most of the floating population as tourists/traders. In 4th century BC Roman architect Vitruvius saw Halicarnassus as a naturally fortified place favourable for trade and with a harbour, and made it his royal residence. 55 miles south of Baghdad was Babylon, the city of Nebuchadnezzar. King Hezekiah tells to prophet Isaiah "They are come from a far country. Even far from Babylon" (2 Kings. 20. 14). This sentence shows that they considered Babylon as the most distant place they know of, and the word even far from means they were aware of the places beyond Babylon exist but they haven't known. In 1792 Babylon came into being which marked the reign of Hammurabi. That was 1300 yrs before Herodotus. Law was written in stone 8ft of carved black diorite stone. In 604 BC only Nebuchadnezzar II came to its throne. He is the antihero of old testament. (Biblical reference in Kings, chronicles, Ezra, Jeremiah, Daniel, Nehemiah and Esther). In BC 539 Cyrus took Babylon by sword. To the south of Biblical land of Shinar where the first humans of

Babylons settled and learned to build baked mud bricks (genesis 11.2.3).Herodotus says Babylon did not have access to medical practice during his times.The sick person was put in the streets.Everyone should ask what is his/her problem.And give advice on what remedy is known to them from experience or heresay.

But they had some curious customs like burying the dead in honey.Funeral rites were same as in Egypt.After intercourse man and woman should sit over incense and fumigate their private parts with incense.Without a bath they will not touch utensils in home after a intercourse.And every native woman had to go to temple of Aphrodite once in her lifetime and give herself to a strange man who offers a silver coin in the name of Mylitta(Assyian name of Aphrodite).The Coin go to temple .The woman's service to temple is over with that intercourse.

Herodotus called Babylon as Assyria ,He speaks of Cyrus who conquered two Rivers (Gynges and Euphrates)and one city(Sumer).The 180 channels made on Gynges on either side(360)dried up it and he said I have punished her.He drained Euphrates so that his army could cross it ,and converted it to a lake.That was manmade political destruction of rivers.In 539 BC Cyrus had damaged the tower of Babylon.In 331 BC when Alexander came it was already in pieces.

The garden of Babylon is described by Diodorus Sicculus(1st century BC) as 400 ft square born out of love of one man for one woman.Cyrus for his Persian courtesan ,a homesick consort,and Nebuchandnazzar for his wife Amyitis ,daughter of king Medes. Strabo describes it as square with each side 4 plethora.people raised water to the garden terraces continuously from the Euphrates and dried it up.Herodotus does not mention the garden.But he mentions that the sundials and gnomons came to Greece from Babylon.The main crops grown were wheat,barley,millet,sesame,dates.Use of palm tree for food,wine and honey is mentioned.The local custom of bringing all girls to a market and offering them for sale as a bride is described.Marriage was for them a object of transaction just like cattle.Poor girls were allowed to do prostitution and in 1000 BC king of Israel David predicted destruction of Babylon due to such bad practices (psalm 137)and this happened with Cyrus.Herodotus says the Greeks and Persians were fighting continuously for supremacy of having the oldest race in the world.Cambyses,son of Cyrus decided that it was the Pterygians who settled in 1200BC inAsia Minor who are the oldest race.(At that time it was 19th dynasty in Egypt). Amenhotep 11 (late 1500BC) was the overseer of granaries and thefields ,gardens and cattle of Amun ,the God .The high priest was the great confident of the Lord of the two lands.

Three embalming models of Herodotus time gives us medical knowledge of anatomy as well as the use of herbs .

1.Most expensive and perfect.With iron hook extract brain through nostrils .What the hook cant reach,rinse out with drugs.Flank laidopen with flint knife.Contents of abdomen removed.Cavity cleansed ,washed out,with palmwine and infusion of ground spices .Then filled with pure myrrh,cassia,aromatic substance with exception of frankincense,sewn up.Then placed innatron entirely covered with it for 70 days never

longer. Washed, wrapped from head to foot in linen cut to strips, and smeared on the underside with gum which is used by Egyptians instead of glue.

2. Organs not removed. Oil of cedar injected through anus by syringe. Anus stopped up to prevent liquid from escaping. After a session of natron pickling, anus uncorked, oil drained off. Stomach and intestines rush out in liquid form. Done for animals only.

3. Clear out intestines by a purge. Keep body in natron for 70 days. Natron is naturally occurring deposit of sod. carbonate, and bicarbonate, sod chloride and sulphate in salty lake beds, and Wadi natrun is an Egyptian town where it is harvested. The water absorbing quality is used in mummification. For mummification 375 pieces of linen were needed total length of 138 meter and amulets were inserted between pieces. If a beautiful woman of a distinguished family died the body was released only after three days of death, because some of the bodies were violated (by necrophiliacs) and the law to prevent it existed.

The Nile :-

The annual floods in summer solstice lasted for 100 days. Low in winter. Why? Herodotus did not get information even from learned priests. They did not know that the monsoon rains falling on the Ethiopian plateau was flowing to the Nile and the Atbara rivers and causing floods and they didn't know where the Nile originated showing the knowledge of Geography was very poor. (compare with Indian scriptures). Herodotus mentions three theories the Greeks thought of.

1. North wind of Sumer blocks the water into Mediterranean (Thales 6th century)

2. Niles flow from ocean that encircle the earth (Hecateus)

3. Melting snow empty into source of Nile (Anaxagorus, Aeschylus, Euripides)

4. During winter sun driven out of his course by storms to upper part of Libya.

Jeremiah 46.8 says: -Egypt rises up like a flood its waters more like the rivers and he says I will go and cover the earth, I will destroy the city and its inhabitants.

Herodotus wrote, "when Nile overflows whole country is converted to sea, towns alone remain above water, and look like islands on the Aegean. Water transport is used all over the country at such times.

Nile gave water to Sudan, Ethiopia, Tanzania, Kenya, Burundi, Rwanda, Uganda. Then why Egypt alone is the gift of the Nile? The others have rains. Egypt has no rain. It depends entirely on Nile. Nile is lifeblood of Egypt its rural economy and agriculture. Herodotus says harvests were with less labour and no plough or hoe needed. They just wait for the annual floods of the river. When it recedes sow the plot and harvest. Bible speaks of 7 fat

cows and 7 thin cows the feast and famine due to this .

Worship of Crocodile, and women wearing the symbol of phallus(linga) tied to neck, custom of showing a dead body(puppet) after every feast to remind that the body is temporary, horoscope, a deity for each month and day, foretelling date of birth, character and fortunes , day of death etc, growing crocodile in a lake with gold ring in ear and bracelet on front foot, and feeding with respect , a collection of surgical instruments, and musical instruments including a tuning fork for acoustic testing are seen in Egypt most of which are common to Indian culture. In his 24th year, Alexander came to fountain of Siwa to ask the oracle there whether he was the son of God.

Greece absorbed Egyptian mathematics and not were inventors of it since in 1890-1650 BC , several years before Euclid mathematical texts existed in Egypt and 700000 scrolls of them were lost in fire of Alexandria. The knowledge of Greece came from Babylon and Egypt and from where did it come to Babylon and Egypt?

The Persians did not have the naval powers which gives knowledge of winds, globe and

stars and astronomy and geography. How do we know that?

Artemesia , Xerxes' only female commander during battle of Salamis says:- Spare your ships. Do not fight at sea. Greeks are superior to your men in naval matters , as men are to women." He didn't listen and his fleet was routed.

But though the Greeks are said to be good at naval war they didn't know the sea route and Alexander had to use the land route to India. That means someone else was helping them. The Greek men navigated only in sight of land . They could travel only in the calm waters around their region and their ships were sunk if more than 300 people were on board. They were not good for long sea trade.

Artabanus , uncle of Xerxes says sea is his enemy and they too were not good sailors and did not have expertise to circumnavigate the world and to get first hand knowledge of winds and stars by constant observation . Xerxes knew that Asia is the source of wealth and trade and knowledge and he made a bridge across the Hellespont to link Asia and Europe and had to see a violent storm smashing it up to pieces.

Herodotus reached Samos by traveling along the coastline always in sight of shores 15 miles north of Samos is Turkey. Samian olive oil is the whitest . Apuleius says the soil is not good for corn, nor for ploughing , and is fertile for olive groves alone. Used neither by wine dresser nor by kitchen gardeners . Aesthelius of Samos says twice yearly crops of figs, grapes and apples , pears and roses were grown. English poet George Sandys writes "fruitful in all but vines". Till AD 1610 grapes were not grown in Samos. They had excellent honey. Samians took vine from Muscat grapes according to Byron. Samos is a Phoenician word meaning "High". Monut Kerkis 4700 ft and Karvounis 3780 ft ascend for more than 1/2 of the islands surface . On coast are mountain jungles and its most famous son is 6th century BC Pythagoras. Samos sent slaves to Egypt both women as wives/prostitutes and men and that was their trade relation to Egypt. They were not at all partners in long distance sea trade of Phoenicians and were just intermediaries taking benefits out of it .

During Solomon's time ,in BC 1000 a Phoenician naaaga fleet of him took gold,timber and precious stones from Ophir and in Tharshish his ships were stationed for 3 yrs to load with gold,silver,ivory ,apes and peacocks.Ophir is a Greek word for serpent)Ophis).Hebrew also use the same word for serpent.So the Hebrews called the Phoenician city a scountry of Naaga ,not the Greeks.And Oviar is a naagagana according to Chirupaanaatupadai. Oviar are the panchajana or the silpi class of India and are naagagana and brothers of the winds(Maruths).

See the comparison of words used in Hebrew and Greek for tamil and Sanskrit

Ibha (Elephant) for Ivory in Hebrew.

Kapi for monkey /apes

Akil is Ahalim in Hebrew

Thukkeeyim is peacock from thokai in Tamil adapted in Hebrew.

The Greek words adapted;-

Rice/Oryza is Arisi of tamil

Ginger/Gingiber is Inchiveru of Tamil

Cinnamon /Karpion or Karuvaapatta .All these were from Malabar /south India where sepents are paradevatha in each home.

Sanchonni Athen the Phoenician historian has a suffix of Athen which is common for kerala kings and he writes that Lnka is under the protection of 4 kings and they are subordinate to a paramount sovereign.To him they pay tribute of cassia,ivory,gems and pearls.The king has gold in abundance.The three kings are the Chera,chola,Pandya in south India and the 4th is in the North of Lanaka in charge of the city where pearlfarming is done.They were to control the illicit traffic to and fro of ships between India and lanka and were the chief of the Ramnaadu.Upto 5th century AD this was the condition.In 50 AD the ship sent to Arabia to collect revenue (of Annius Plocanus)lost its way in the monsoon winds called Hippuros(The horse/Aswins)and approached the area ruled by king of Kuthiramala (The mountain of the horses.Kuthiraan in Malabar).This area was the landmark for those ships which travel in Arabian ocean.The king of the region decided to have direct contact with the Romans and sent his people under the guidance of Rachiya (a prince) so that they are safely sent back to their country.They knew how to come back by the red sea path .that means the sea route was familiar to people of Malabar.That is how the Hippalaus was discovered or known to the west.It was not a scientific discovery but an accident only.From them Pliny understood that 500 towns are there in their country,and Palaisaamunda is an important site and around it is sea with pearls etc are collected.It had a population of 200000 people at that time .And from a lake one branch flows down to this place and another to northern direction is also told to

him. The corals of gulf of Mannar is thus described in detail from heresay .150 AD saw Ptolemy's work. Ptolemy knows little about Ceylon but more about Malabar and South India.

Ptolemy wrote:- Opposite to cape Cory(Kumari) is the island of Taprobane a projecting pout. It was called in the past as Seemoundou (The seema or end of Indou or Sindhu) .Now it is called Saalike. And the inhabitants are called Saalai .(Chaaleeyar/salai is a community dwelling /like Yagnasaala, agrasaala etc or a group of weavers)The hair is long like women. They have rice, honey, ginger, beryl, hyacinths, mines of every sort ,gold, silver, elephants and tigers.

The opposite point to Cory is called The North cape. Boreion Akron at longitude 126 degree and latitude 12 degree 30 “.(The 12 degree North latitude being Honaver, Kunta in Karnataka area, during Ptolemy's time from Kanyakumari to northern part of Karnataka was under the one administration and it was the Chera king as we see in Mooshakavansa also). He gives some other names with latitude/longitude.

Where Korkai bay ends is the cape Cory and it is there where the Arkaaric gulf starts. From there to the Koroula nagara (NE of cory) distance is 3400 stadia for right across. Since navigation is in the curvature of gulf, reduce $1/3^{\text{rd}}$ and then it is 2030 stadia only. Another $1/3^{\text{rd}}$ reduction if continuous sail and the distance is only 350 stadia. The cape Cory, Town of Argerou, and a mart of salour (salayur), Bathoi, kouroula are in Pandya territory.

If Kodikkara/Dhanushkodi is Ptolemy's Kory his Boreion kron becomes Yazhpanam of Srilanka .But it is not at 12 degree north but well below 10 degree north in latitude. His Palai Saamundaomana is the old border of India or Sindhudesa. And it is marked in his map as the sea between India and Lanka. Lanka is Srihela dweepa in medieval writings and Heladweepa became the Eladweepa. Elam is a special spice .

Before Ptolemy ,400 yrs ago, Onesicratus mentions Taprobane. It is seen in Asoka edicts. Thamraparni in Paali is Thambapanni and it flows through Thirunelveli. And Arthasathra mentions two types of pears from Pandya kingdom, The Pandyakavatakam and the Thamravarnikam. Megasthenese calls Palaigonoi. (The old naaga) The younger race/branch as Ilanaaga .The gulf north of Rameswara is called as Orgalic gulf by Ptolemy from Tamil word Arkkali (resounding sea). Arkkali is also a shallow sea. Aarkkali muzhuvinathikar koman is the King of Chera country. (Ouvayar Puram V 91) .The big drom of Cheran is the ocean here. The Bathoi in Greek is the veda. The veda lands of Chola country are in Damurike (Dravidian) coast of India at the mouth of Kaberoi or Kaveri. Beyond Korkai is Argaru with muslin and pearl, the Uraiur but in Ptolemy's time Kaviripoompattana was the chola capital. Sindhones margaritidae meant muslins of Sindhu sprinkled with pearls The Naga and the Kadamba lived in South India upto Ceylon, and kadamba or kaadava vansa were rulers of Kerala. According to puranaanooru(335):-

Thudiyān, paanan, paraiyan, kadamban enṭṛil naankallathu kuḍiyum illai.

Except these four groups no one lived in Tamil country. The Thudiyan is the one who plays on thudi a musical instrument which was played by Shiva, Paanan is the singing minstrel and vaidya, and manthravaadi, and paraiya is the one who beats the drum or para another musical accompaniment and timekeeper, and kadamba is the dwellers of forests and mountains and the wedda kings or kaadva kings who were powerful in Kerala. The foreigners were afraid of Naaga and Kadamba because of their fierce nature, courage and prowess in warfare and guerilla methods. Chenguttuva and his father destroyed the kadamba but they came up again as the strong kings of mountainous dwellers. The kings of Thalappally/Mooshakavansa at Punnayurkulam and upto Kuthiraimala belong to this vansa of Kaari/Kaareesa in St Thomas stories.

Where the Sreelankans great navigators? No. Because the 1st Ceylon embassy to China took 10 years and it was landroute they took (in 405 AD) since they didn't know how to cross sea to China. Sea route established only after 5th century when the Tamils came to Jaffna and made it a popular port.

The name Marakkalayar was common to Naaga, Tamil as well as Arab shippers since it just means one who travels in a ship of wood. It is not a caste name. The same is true of Markkara. Mara is Kattumara and ship of wood. Marakkar is one who has such a ship and navigates it. It is a Tamil word.

It is said that in the 6th century BC Srilanka Yaksha lived in the center and naaga lived in the north and west coasts and therefore, it had been called Naagadweepa. Yaksha were identified as Yuh chi, a yellow race in North East Himalaya, and Bengal with Mongoloid features. And the Veddas of Ceylon as survivors of this race by Mr Parker (Ancient Jaffna from very early times to the Portugal period. Mudaliar C Rasanaayagam. Asian educational series 1984 New Delhi First published in 1926.) But anthropologically both Sinhalese and Vedda are not mongoloid but a dolichocephalous race and resemble the preDravidian race in India. In the pre-epic period, sage Pulastya's son Vishravas in Idavida, (From Nepal, part of erstwhile Mithila) had a son Vaishravana appointed as ruler of his kingdom in Lanka and his subjects were called Yakka/yaksha. The name is equated with Dekkan, Dekkini, Thekkan, Thekkini, yakka, yakkini, daksha/dakshini Dakshinapatha and Yakka is a short race and Daksha or expert in architecture and called Oviyar. The subjects of Vaishravana were great architects from the Deccan peninsula and even after Ravana, his stepbrother took over, they continued be so. Chief of the artisans Viswakarma, belongs to the naaga tribe of Oviyar and the five naaga tribes were born from the five faces of viswakarma. They are according to Tamil traditions

1. Manu or kollar (Blacksmiths and kings who kill)
2. Maya (Thachan/Dakshan the carpenter /Magicians)
3. Twashtrakannar (kannaar or kannavar) The brass finders The Kanwar

4.Silpi/sirpi .The masons,stonecutters,sculptors,architects,image/idol makers,painters.

5.Viswannaa or Thattaar Goldsmiths.

These 5 groups of artisans were Oviyars of the Naaga class of India and Ceylon from time immemorial and called the panchajana /panchayaths of the village along with pure agriculturalists.They were parttime agriculturists and parttime oviyar ,later specialized only for their respective handiwork . In Ramayana Rama asks Hanuman who goes to the south to search Sita,tell him to search in the capital of the Naga .Mahabharatha speaks of the Naaga as A highly civilized people of Southern states having a well established law and order and administration and under their own kings.Thus Dakshinapatha is the kingdom of the Naaga tribes.Budhist records say in Kampilliam Naga kings rule. Naagapura,Nagarjunakonda,Naagapatina,Naagarkoil in south and east and Nagarkot in northern Nepal show that Nagaas or oviar had been a very strong race in India both north and south.In Samudraguptha's Allahabad victory pillar we find two kings Naagadatha and Naagasena(Dutha is a vaisya name and Sena is a Kshathriya name belonging to Bengal).The nephew of Pulakesi II was Nagavardhanan (Vardhanan also is

a Vaisya name).In 800 AD the Gurjara king was a Naagabhatta.In 2nd century AD powerful Naga kings ruled in Nagpur.They had Tiger and snake in their flags as symbols of their race(Chola also has tiger).In 11th century central provinces ,Bastur state, Bhogavathy and Chakrakoota was under Naagas.And in all ancient Indian scriptures Bhogavathy is the capital of Naga of Paathaala.In Maghada the Sisunaaga vansa is called the kshathriyabandhava and the kshathriyaadhama (relatives and the low castes among kshathriya).According to Mahavansa their powerful centers existed in 6th century BC in the northern Nagadweepa and the western Kalyani .The uncle ruled at Nagadweepa and nephew at Gandhamadhana in Rameswara.The uncle is a Maniyaksha and has capital in western Kalyani on the coast of Arabian sea .A descendent of the king of the Kalyan (Thissa of Kelaneeya)is ruling in 3rd century BC in Lanka and his capital also is called kalyani.These two Kalyans are still recognizable in India and Lanka.The wife of this Lankan king had an affair with a Budhist monk and the king punished the bhikshu by roasting him in a brass pot.The ocean was angry and rose up to devour Lanka and the southern states of India which were under him.The only big city which escaped was the Rameswara of Sethupathi in that floods.

Vadivel erinthavan pakai poraathu Pattuli.Aattudan panmalai adukkathu
Kumarikkodum kodum kadal kolla(Chilapp.Canto X1.11:18-20)

Mentions this floods.When 49 great cities were lost ,Pandhya had to move his capital to Madura.He lost between the rivers of Pattuli and Kumari ,700 kaatham of 7
Thenkainadu (coconut groves)7 madurai nadu(of sugarcane)7 munpaalai nadu and seen
pinpaali nadu(Paalai,a tree),7 kuntranadu(hilly areas),7 kunakarainadu(east coastal)7
kurumpainadu(small palmyra),forests ,rivers,plains (thadam) upto Kumari hills in the
north .This happened in 250BC when Kavadaipuram,49 grama,and the west part of
Nagadweepa were lost to the raging sea by Pandya and the Thissa king of Ceylon.After

that started the third sangam period at Madhura ,the new capital. About the brass makers or Thwashtakannar,the Srilankan records in Tamil say,

Manthai nagar uraivor ullokathil vaanipame purivor
Kanthamalaikkuriyor Panchaalari Kannuvar thontrinaare.

The Kannar were born among the Paanchaala (the five)who ruled the Kaanthamalai or magnetic mountains,who live in Manthai (the centers of seashore)and do trade and commerce inside the cities,and they married from the women of their Yaksha kings.They were great visionaries and hence called Kanuvar.(ssers,paarpanar)

The asura king Soorapadman had a wife from a devakarmi daughter (Padmakomala)and is famous because he was killed in war by Kanthan Kumaran.Manthodari was daughter of a maya (carpenter)and married Ravana.The descendent of a Yaksha king and a naaga princess was the next king .This is so not only in Ceylon but all over India.The sea pirates of Manthai were Naaga in period of Asoka.The mountain of the Naaga was called Kanthamalai because it attracted travelers by its wealth and beautiful women .In 1st century AD there was a brass fort in Dwaraka in Gujrat made by the Kannar/brassfinder.The name kannar is also attached to Krishna,the hero of 3000 BC India and his brother Balarama the powerful Naaga.,the builders of cities and forts and great agriculturists wielding a plough..

Chembu punainthiyattiya chenedum purisai
Uvaraaveenku Thuvarai (Puram V 201)

Both Vijaya from kalinga(Huen tsang)and Karikalachola(Purananooru V 39) had destroyed their forts and cities and made them captives to work in Ceylon and in Kavery delta.(1st century AD)

The Chola is called Chembiyan or brass worker's leader.Chembeeyam is actually two metals combined Chembu and eeyam and Karikala who won over Thamraparni is given that title. Manthai is a market place or town/urban center /Port where artisans live and Mandapa/Mandu/Kathmandu etc names like Mandavi/Mandodari as the name of princesses show how the artisan Naagaas were respected.The Paanchaala king Drupada was the father of Paanchaali the consort of the five brothers of Pandava and this custom is still followed in many artisan groups.

Kurumthokai(V 34) speaks of the Manthai of Kuttuva(Chera king)where the elephants run away hearing the sound of farmers working in the big garden forest(Perumthotta).The base of sea pirates of the west coasts was manthai. Such manthai existed along the coastal regions as wellas (Vella ,Vellala ,Valluva)along the land routes ,in rajasthan,Nepal etc showing the wide network of the panchajana in agricultural and trade commerce economical networks.In 200 AD ilankaikizhavan Villi Athan is a Chera king and had broad fields of rice ,and sea coasts where beautiful women found roots of freshwater lotus and eggs of tortoise as a delicate food.In Kuthiraimala on the west Naaga rule and it is called Acha (acha,kocha of jains)nagara by some.The kuthiramalai and its

surroundings are ruled by Kari. The acha or Aswa. This is somewhere in the western ghats according to Mudaliar Rasanayagam (pp 26). This part is Kuthiran hills the area under Thalappilli kovilakam (my mother's father belonged to it) and ascending Kuthiran we reach Palghat and Kollangode (The Kadamba ruled area) the old transport to inland leading through Palghat pass to the Karoura /Karoo of old Chera or konguchera and Pandya countries and beyond to the Chola area.

They were called the Aswins, or the Hippuros by Greek because of their prowess in naval expeditions and as Phoenicians (Phaneesa with hood/serpents) by old world civilizations. Kuthirai koorver (Puram V 158, 11 8-9) Uraakkuthiraikizhava (Puram V 168), Kaivalleekkaikkadumaan kotta (11 14-16) one with a fleet of horse and a raised hand which give instruction as shown in many Veerakkal /hero /sathi stones) and a raised hand is the symbol of Emur Hemambika of Kollanghot/Palghat Kadava/Kadamba ksathriya of the vedda lineage. Thalappally also belongs to vedda lineage.

According to Tanjore gazetter in 105 AD killivalava ascended throne and till 150 AD his brother ruled (Perunarkkili) after his death. The son of Kokkili in a naaga princess was Thondaimaan Ilanthirayan and he got entire Thondaimandalam. This child is once lost in

a shipwreck but miraculously escaped and was taken ashore by the waves without any harm. The Ilam (Young) Thirayan (who was brought back by the waves) was due to this event. He was given a part of Thondaimandalam with Kanchi as its capital and was the first king of that district. (Thondi was also the Kadalundi during GreekoRoman trade times) He later changed his capital to Uraiyyur, the land of the naaga. He was present for the great event of Kannaki temple installation of Chenguttuva to which Gajabahu of Ceylon also came (AD 113-135 is Period of Gajabahu). Pukar was lost before that date to floods. According to Ptolemy the transfer of capital to Uraiyyur happened in AD 150. Orthora is his Uraiyyur. Before that Ilamkili was the viceroy in knchi to show his prowess in administration before he was made king. From AD 150-175 Period the Thondaimandalam of Thondaiman Ilanthirayan came to power. He is considered as the 1st of the great Pallava dynasty. And was a great Vaishnava king. He was the combination of a naaga lineage of Manipallava dweepa (Jawa) and Ikshwaku/Suryavansi Chola and a young sprout and a new bough (Pallava) of that great lineages of ancient fame. According to the Rayakkotta plates the Pallava Vishnugopa had ancestors as contemporaries of Samudragupta and he belongs to bharadwajavansa, a brahmakshathra, through a naaga princess. When central India was having a strong naagavansa rule we find strong naagavansa in Ceylon also showing a unified system all over the south and central India. During Sathavahana times the Chuthunaaga line became strong. The elder pallava

kings were contemporaries of them. Intermarriage of the naaga and the sathavahana rulers created the chuthunaaga race. From 6th century BC to 3rd century AD the naaga empire existed. And their capital was Kantharode (Kanthaloor) in Kuthiraimala with its Maathothai (Manthai).

Arjuna married Chithrangada a naaga princess from Manipura and after 3 yrs he came back visiting the seacoastal sacred cities. He goes from Manipura to Gokarna visiting

temples on sea coast and also married Allirani of Pandya lineage on his travel along the coast. The progeny of Pandava /paanchaala are the southern chandravansi kings. In 132 a Franciscan Friar, Odoric wrote that, there are only three kingdoms in south India. One is Malabar, the second is Minibar, and the third is the Mobar to where 10 days journey from Minibar is needed and where apostle thomas body is buried. That means Malabar /Kerala, Manipura /Lanka/Yazhpaana and Maayilapura or Mylapur were the three places he knew.

The contemporary of Arjuna was Cheraman Perumchottu Udiyan Cheral Athan, who gave free food to both sides of the army during Mahabharatha war. Chilappathikaram calls him Cheral Poraiyan malaiyan as king of the Malaya mountain. According to Rajavali in 2347 BC the old kingdom of Ravan in Lanka was taken by the rising sea. At that time the capital of the naaga king of Manipura is in Kavatapura and not in Madhura. And Alli is the same as Chithrangada. Mahabharatham does not call Chitravahana as pandya but as the naaga king. In the aswamedha of Pandava the horse reached Manipura, in the Kavata (door/dwaraka) city of Vavravaahana (Babruvahan) son of Arjun. Uloopi another naaga wife of Arjuna protected his life. She was cousin of Chitrangada, (Aswamedhaparva 1XXIX P 192-200). The mace of babruvahana had a golden lion on it. And on his flag was a golden palm tree. Both are the signs of Pallava kings. And flag of palmtree shows his Chera lineage also. The symbol of lion of pallava and of simhala raajavansa is noteworthy. In 1815 the British took it as their flag sign from India/Ceylon. The entire India from Assam /Bengal/Bihar/Nepal to southernmost tip and Srilanka show the relation with Naaga /Phoenician/kingdoms and the artisan/oviyan/Panchayathana culture.

Mahavansa say that the grandmother of King Vijaya was a daughter of King of Bengal (vanga) in a kalinga princess and she eloped with Simha of Latadesa (Gujrath). She had two children in him. But she could not adjust with the robbers of the latadesha and went back to vanga with her children. Therefore Simha came 700 miles to the east and started to destroy Vanga desa. After conquest he gave back the land to Vijaya's stepfather Simgabahu and went back to Latadesha and built a city of Simhapura. This city is not in Gujrat but in kalinga, which means he built a new city there, not in Latadesha. Vijayan came to Lanka touching Supara and Barukatcha which means he has traveled not from kalinga but from west coast and the writer of Mahavansa does not know the geography of west coast and its relation to east coast. According to Vishnupurana kalinga was founded by Kalingan son of Bali on the upper Indus (Upper part of India or sindhudesha) and is very ancient and it consists of Orissa and parts of Bengal. Anga, Vanga, Kalinga and mlecha (Meluhha) kingdoms of Dravida in the Deccan are always mentioned as a group together in Mahabharata. Two sons of kalinga king Sruthayu is killed by Bheema in Kurukshethra war. Srikakola was its capital (now srikakulam). The Malay people call all Indians as Klings (Kalingas). In the Srikakulam district Ganjam jilla of Orissa is the old cite of Simhapura, of Simhabahu 115 miles west of Ganjam. This city is mentioned in Chilappathikaara also.

Vijaya first stayed in Kuthiraimala and married a princess of yaksha called Kaveni (Kabani river area) and repaired many temples and only after 200 years after his death the southern kingdom became under Devanampiya Thissa's brother Mahanaga

Kuthiramalai is Kathiragoda in Telugu and simhala(goda= mountain or Mala)and Portuguese call it Kandarcudhe (Kanthar /kanthan is name of Muruka and is the surname of old Thalappalli kings).In Paali it is Kajragrama or grama of Karthikeya.Kathir is light and kaama is love and it represents the enlightened land of love.Vijaya was the one who called his new city as kadiramalai in Lanka and started the festival of Kadirai Andavan there just as in tamil countries of Chera,chola,Pandya of south.And he called as the greatest Naaga king of Ceylon at kathiraimalai.He lived as guest of kathiraimalai in Tamil country where the naaga and the kadamba rulers were established and then built a city of its model in Lanka ,Since he had lineages from Kalinga from her grandmother,vanga from his grandfather and lata desha from his father and had married a yaksha princess belonging to naaga tribes of oviyar at kuthiramalai he was a blend of entire southern,western and eastern India and he had a cosmopolitan style of all of them and his progeny from naaga /yakka lineage was the beginning of Mahavansa in Ceylon. During Vijaya's reign the ancient Indian system of agriculture ,trade and commerce grew under his patronage.

The great paddy fields of Vijaya spread for acres.His own daughter Suvarnapathi takes food for him and his reapers ,like what is done in old Tamil speaking areas still today without difference between class or creed.Rice was staple diet of king and peasant alike.Both worked in fields .Revenue of state from rice made it a important industry. Immense tanks ,wells ,canals of irrigation were constructed.Even after 2000 yrs the same methods are adopted still.The extensive scale of sharing between peasant and prince alike made it a honourable profession .

Uzhuthundu vazhvaara vazhvar Mattellam thozhuthundu pin chelpavar(Kural 1033).A network of tanks and canals stored water the year round so that even if rain does not come an year,the people could irrigate to some extent .A great tank could feed land for 1 million parah of paddy.Such Chira(lakes)were constructed by kings and by temples and by rich as a public service and to protect water reserves of the soil.The naagas were expert weavers and wove clothes of finest texture with coloured prints which were as soft as the coverings of a snake.(Aravuri or aravu=serpent /the middle of body .Two meanings.Uri =the discarded skin of serpents /the cloth or covering of the middle of body .two meanings) .(Porunar 11 82 83)Cherupanattupadai,permpantupadai and Purananooru also mentions this.

Paampu payanthanna vadivil kambin Kazhai paducholiyin izhai manivaaraa Onpoonkalingahm (Puram V 383.11:10-12)is the margaritidae or clothes of muslin sprinkled with pearls.

Neelanaaga nalkiya kalingamaalamar chelvarkamaranthanan kodutha...Ay)Chirupaanattu 11.95-97)Means the Ay king (Yadava /Venadu/pandya)dedicated the the silk gifted to him by the blue snake/Neelanaaga to the God under the tree and here Ka +Lingha is the sign of Brahmi + on which a tree is worshipped a constant sign in IVC/Harappan artifacts.

Since India provided clothes and luxuries for women of Babylon,Assyria ,Egypt and Greece and Rome the trade and commerce was the enterprise of these Naagavansi

Phoenicians from prehistoric/historic times. Pliny noted:-India drained the Roman empire annually to the extent of 55000000 sesterces (equivalent to 487000 pounds) and this is the price we pay for our luxuries of our women. In Korkai women and Kallar worked in pearl fisheries and in making shank bangles and ornaments and these were taken to north and further west by land routes also. The iron smelting, brass works, etc were specialities and even surgical instruments were made.

Names with suffix Pon as in Ponnani /ponnadu/Honnavar or Ponnavar etc meant the specialization in gold and its availability as ore. In river beds like Chaliyar gold was taken from river by filtering sand. Before Ramayana period the Yaksha and Naaga tribes had well organized sedentary, hereditary republics with elected monarchy and purity of race was preserved by intermarriages just as in the monoculture farms and cross marriages did encourage crossbreeds as well to strengthen gene and after 4 generations of marriage between two families it was considered as a pure race. The Naaga built the first urban centers and hence the urban centers were called Nagara and they made the first writing and hence called the Naagarai or Devanaagari. Paali means old. The old writing of the Naaga was paali which was replaced by the Sanskrit or devanagari for about 3000-4000 yrs and after Buddhist times the old Prakritha lipi was again reinstated and called Paali /Neypaali (the new paali/the new old).

The administration of Naaga had 5 perumkuzhu (big groups) and 8 peraayam (assembly). The dharma of protection of priests, women, cattle, agriculture of both sides was followed even in battle. The 5 big groups were

1. Amaichar (ministers)
2. Purohithar (priestly astrologer/Teacher)
3. Seanapathiyar (army /navy chiefs)
4. Thavaathozhitoothuvar (ambassadors, diplomats/messengers)
5. Chaaranar (spies or guptachara)

The 8 assemblies:-

1. Karanathiyalavar. administrators/The karanavars
2. karumavithikal. Accountants who decide the laws of economics
3. Kanakachuttam kadai kaapaalar. Royal dependent confidential kinsmen, priests, physicians, confectioners and soothsayers who are concerned with protection of Society
4. Nagaramaanthar. The chieftains and citizens of urban centers with markets, chiefs of city gates, urban representatives

5.Nani padaithalavar .The infantry captains

6.Yaanai veerarivuji.The captains of elephant squadrons and captains of cavalry

7.Mathavaivaraniyar .(great sages and their progeny)

8.Makkal,anjoottuvar,manikkiramathavar ,panchayathanar . Citizens of various jobs and guilds of them .

Who were to be protected in wartime? (puramV 9)

.Aavu,maaniyar,paarpanamaakalum (cows,respected elders,seers)

Pendirum piniyudaiyeerum penithen- (women and sick people)

Pulavaazhnaarkarum kadanirukkum (those who are for doing the ancestral rites

Ponpor puthalvar peraa atheeru (who are the golden children)

Memmam pukatividuthu nammaran chermeen(to be taken to a safe refuge)

What were taken in ships?

Muzhankum kadar thantha vilanku kathirmutha(bright lustrous pearls given by the echoing seas)

Maram poztharutha kannerilankuvalai (broad shining conch bangles cut with saw neatly)

Parathar thantha palveru koola (different types of grains consigned by the parathaver or the fishermen folk of the lowlying areas who are great artisans and agriculturists)

Mirunkazhi cheruvinneem pulivelluppu(white salt from the clayey beds of sea and sweetened tamarind)

Paranthonkuvaraipin vankai thimilar kozhumeen kurai iya

Thudikkattuniyal vizhumiya naavaay(the fleshy fish cut into round pieces by the strong armed Timila or thamizha fishermen and salted and dried on sanddunes loaded into a wellbuilt ship.

The estimated goods were impressed with a mark of the empire for recovering the Custom duty..In Chola it is tiger. (Puli porithu ppuram pokki mathi niraintha malipandam).

The assignments were sent in ships and in carts accompanied by armed soldiers and these soldiers were wearing a striped bandlike snake ornament on shoulder and chest

Viravu varikachin venkaiyonvaal

Varaiyoor pamper poondu ..vampavar.

A classification of people according to the regions they were lived:-

1.Kurinji were hill tribes and included vedar or vedda and Kuravar/kuntraar (girijsana/kurichiar)and their lifestyle and agriculture and food habits suited the geographical features of their habitat for survival.God Murukan protected.

2.Mullai forest tribes and pasturelands. The idaya ,wandering tribes and aranyaka,kaadar /kaadambar .Maayon or Vishnu protector.

3.Marutham .people of arable lands .The uzharvar who plough and do agricultural activities .Indran and pooshan and Maruths protects.

4.Neythal.The sea coastal people called parathavar who also do agriculture and are artists /musicians/dancers /fisherfolk. Varuna.protector..

5.Palai.Dry and arid land where Maravar and vedar and kallar lived.Kottavai or Durga. Each tribe had their own chieftain and a common chief or king for all.Priests,ascetics and holy men(Brahmins)came from all tribes depending upon their vaasana.They were called paarppanar (seers)or anthanar due to compassion to all and acceptable to all.Honoured by all.

Anthanar enpor aravor mattavvayirkku nchentanmai poondozhukalaal(Kural 30).Their habits of unselfish behaviour considered the best by all people for healthy social life. Vellala priests /gurukkal also were vegetarians.Royalty ate rice and vegetables usually but on rare occasions they ate meat and drinks toddy taken from palmyra.The vellala food was rice,vegetables and fruits.

Idaya ate millets and milk products.Fruits ,vegetables.Both jurava and uzharva kept cart wheels and ploughs against their walls.large pillows supported the portico.Flourgrinding and avalmaking mill stones ,sugar cane presses .paddy granaries,childrens toys and pushcarts seen around their residences.Diet was rice,boiled pulses,cooked fowl.The

kurichiar had same habits.Among kurava only a few had this habits of agriculture .Others were wandering tribes.

Fishermen took rice gruel with palmyra leafs .They took toddy and burned fish.Veda had domesticated dogs for hunting.They ate redcoloured rice with bran,meat etc.They stole cattle and drank toddy .Veda women(Ainer) dug up grassrice from ground anthills and ate it with salted meat.The rice thus obtained is called mumpirai arisi .All the tribes were hospitable and it was considered avirtue to be hospitable to guests(Athithipooja)by all.Both men and women had longcoiled hair ,combed and smoothed .Females wore it in single or multiple plaits upto 5 which hang behind or kept as a tuft(konda)in shape of a plantainbud.After bath hair was dried with fragrant smoke of akil ,jasmine,and flower garlands worn.Both men and women wore ornaments.

Flora related to kings and warriors:-

1 Vetchipoo or Thechi (Ixora coccinea)after stealing or winning the cattle from the neighbouring chieftain.

2.Karanthai (ocimum basilium)or common Thulasi when the cattle are taken back by the owner.

3.Those who were prosecuted wear Vanchi.The Chera king wore vanchi even when not prosecuted.They were always the prosecutors of others?

4.The defenders wore Kanchi or *Holoptelia integrifolia*. Where they always the defenders?

5.Defenders of a fort wore Nochi or *Vitec trifolia*.

6.Those who sieged the fort wore Uzhinja(*Illecibrium lanatum*)

7.Thumba or *plitomus indica* was worn by warriors

8.Vaaka or *albezzia lebbele* was worn by the conqueror Emperor of Chera kingdom at Vaakayur Perumthurai or Vakayur great harbour (in Thirunaavaai) once in 12 yrs .
Vaaka +Kaadaka or forest tribes makes their racial name Vaakataka .And one synonym for vaaka is Mooshaka (which also means a rat) and therefore the Mooshaka dynasty of Vaakataka/Kaadava /Naaga /Yadava lineage had been the oldest known and most respected dynasty from prehistoric to historic times and they existed from Mahishmathy in central and Northwest coast of India upto the southern tip of India

Flora related to love:-

1.Samyoga/union of couple Venkai (*pterocarpus bilobus*)

Kurinchi(*calophyllum inophyllum*)Kaanthal(*gloriosa superba*)

2.Viraham /separation

Kura(*webera corymbosa*)

Mara (*Eugenia racemosa*)

3.Vaasakasajjika (waiting)

Kullai or thulasi (*ocimum sanctum*)

Mullai (*Jasminum trichotonnum*)

Thontri/kanthal(*gloriosa superba*)

Pidavam ?

4.In quarrel./paribhava

Lotus,waterlily (*nymphaea rubra*)

Kuvalai (pontedaria)

5.Commissuration (proshithabarthruka)

Neythal(Nymphoea alba)

Thalai (Pandana oderatisssima)

Mundaka(lotus)

Adambam/kadambam

Dress of women:-

The ears were elongated to wear thoda,thodu or Kulai.In prehistoric times flowers and leafs were worn and the names kulai and thodu are stillused for golden ornaments. Mekhala was the old Thazhaiuda with leafs to cover body .later it became a relic name for ornaments worn in the middle of body .

Makarakkuzha is a fishshaped ornament seen as symbol in IVC

Naagapadam is the ornament in shape of hood of serpents worn by naaga tribes

Pulippal relic of hunter tribes ornaments.

The singers called Pana wear a hoodlike headdress in ceremonial functions.The Budhists recruited from naaga tribes wore it in upasamvada ,an initiation ceremony.

Women did guarding of fields,crops,garden,grains etc and enjoyed freedom to choose a man .Gandharva marriages and love marriages were common.

The paanar/virali/women were educated and made extempore poems and music and danced.In kurumthokai among 200 poets 30 are females and in it a Pandya queen,a chola princess,a naaga woman,a kurava woman,a parathava woman,a veda woman are seen showing education and poetry was cosmopolitan.Kakkapadini and nachellayar and ouvayar were great women poets .

Music,musical instruments of different types were known with their principle and mathematical precision of acoustics. Thus from prehistoric and vedic times to historic and sangham periods and till date we see a continuity of cultural practices and ecological interaction of people and their geographic environment.By disturbing that ecological interaction we might destroy entire life patterns in the geographic region.Therefore we should pay more attention for preserving biodiverse environment of our geographical locality .

PROBLEMS OF AGRICULTURE

What the media says ?

Mathrubhoomi

19.10.2009. page 1.

About the “Everyone to the field “programme of the Kerala Government and how it became a failure. The first seeds for this project were sown in the Thiruvananthapuram District ,in the fields of Mankilikkara and Melankode. That date was on January 14th and the chief Minister himself took the farmers to the fields in the presence of his ministers and M.L.As .After 10 months ,the paddy was taken and it was given to Supply co 6 months back. The farmers who took loans to do the project has not got the cost of that paddy given to the Supplyco. The farmers do not ask for any favor except the cost of the paddy given to the Government –run Supply co.

Where was the mistake ?

- 1.The agricultural operation started at the incorrect time.
- 2.The seeds given by Kerala Agricultural department was not suitable.
- 3.Therefore the seeds of “Kanchana” had to be brought from outside. For this 141 Members of legislative assembly members gave 1000 Rs each amounting to 1,41,000. With this 5 hectares each of fields in Mankilikara and Melankode were cultivated.
- 4.For reaping there were no people .Nor were there any Ministers or MLAs .
- 5.Without labourers, the farmers wanted a Reaping machine. This was not available.
- 6.By that time the summer rains came .And the paddy in the fields fell to one side.
- 7.Without any other option, the farmers took the old sickle themselves and turned to laborers (This alone is what I think a co-operative and sensible decision. They could have done this before the summer rains without waiting for the Government support)
- 8.When the difficulties of the farmers became news in the media, the District asked the panchayath to allot a reaping machine.
- 9.In Mankilikkara the farmers had to give 370 Para paddy for the cost of reaping alone.
- 10.In Melankode panchayath ,the officers of the Agricultural department gave 53000 Rs

in their own capacity.

11 .Though there had been ample advice from Agricultural department and their concentrated effort and the farmers obedience was there ,the expected production of paddy did not happen due to all these reasons.

12.The expected production was 2000 Kg per Acre. The actual product was a mean of 1200 Kg only .

13.The saddest part is that when the farmers told about their loss ,the Agricultural department did not believe .But they took it as a challenge and to prove that agriculture can be made a gain they directly did it in 50 cent of fields under Asst Director Mini K Raja .They had an expenditure of Rs 11800 Rs .The Gain after selling the product was 8200 Rs .The loss was 3600 Rs.

14.The similar project under Agricultural officer Chithra in Kalliyur ,by three departmental staff in 85 cents of fields was a greater loss. By these two experiments the Agricultural department understood that the farmers were honest.

In the 4th page of the same newspaper there is an interesting dialogue between a minister and a Agricultural officer.

Min:-There are numerous Agricultural officers here .One cannot walk without brushing against them. What are all these people and the Agricultural Uty doing ?We should get about 25-30 meni from one Hectare and what we get is only 10-12 meni.If this much only

is the production I would not have asked the farmers to do a second pooval.

(This dialogue happened in the Trichur Kol Krishi Yoga and the concerned Minister was Mullakara Rathnakara).

Agricultural officer:-In the first pooval there had been good production. The reason for the first high production is the ekkal which has been deposited during the rainy season.This is not available in the second pooval.Therefore ,naturally the productivity will be less.

Mini:-That means ,even now,the basis for agricultural is Prakrithi itself .My question is what you scientists did to increase its productivity ?

In 1961-62 from 7.53 lakh hectares of fields Kerala had produced 12.08 lakhs tons of paddy. In 2007-2008 from 2.83 lakhs hectares of fields 6.50 lakh tons of paddy .And 80 % of what Kerala needs is now being purchased from outside.

The column says that the cost of production and the cost of the produce does not balance is the problem of the Kerala agriculture.(The real reason for this is not analyzed).

Mooriyad and Kunjan Pulayan:- Kunjan Pulayan ,V.V ayyappan and Vargheese Thoduparambil ,Madayikkonam Raju are among the 10000 farmers of Mooriyad Mekhala.The pattern from the time of Sakthan Thamburan was through canal irrigation

for entire Mooriyad area of 11000 Acres. This existed till 1984. In 1984, a new bund and bridge was created by the Kerala Government and for that they brought sand but no canal was made. By this process the fields are now under water just by a single rain and became uncultivable. The fields which were useless became places for making bricks. Now only 7000 Acres remain. The farmers want their farming operations and their fields back so that they can live in self-sufficient style of food production as before. In the battle between the Farmer and government, Government agreed to some plans but the promises were not fulfilled by the successive officers due to various reasons. After 25 years, the paddy in the fields are under water with the first rains. The 80 lakhs which the Govt had allotted for Mooriyad reformation has been lapse. Raja the farmer has 70000 Rs as debt in agricultural operations. He says, before the Government say "Everyone to the fields, they should see the 10000 farmers here who wants to go to the fields". Varghese Thoduparambil asks:- The Government and officials who cannot make profit from 7000 acre of fields, can protect the 2.76 lakhs hectare of paddy fields in Kerala is impossible".

All the operations which the Government had done after destroying the canals of Sakthan Thamburan, to improve the Trichur Kol Mekhala had been failures and detrimental to the agriculture of the area. Vellayani fields and its loss of agriculture is pointed out as an example. According to K.K.koduMuhammad (Secretary Trichur Kol Krishi Sahakaranasamgham) unless the cost of paddy is revised according to the times, the paddy farmer can withstand all unfavorable situations. This is proved by the words of Dr P.Yagin Thomas, statistics department of Kerala Uty.. An agricultural laborer gets a

mean 600 Rs per month in 1983 and 2003 it is mean 6000 Rs. It is a 10 times increase. But the cost of rice in this 10 yr period is 274 % or 2.75 times only. In the beginning of 1980s for one Kg paddy the cost was 50 paisa and the amount a laborer got was 5 Rs according to kol farmers of Trichur. In 2009 the cost of paddy is 12 Rs and the agricultural laborer has to be paid Rs 350.

The production of paddy in Kuttanad is 5 tones/hectare. For each ton 11000 Rs and for 5 tons Rs 55000 is the gain.

Preparation of field, kummayam, sowing, fertilizers, removing other grass etc, pest control, and all the other production operations need Rs 19000. Balance 36000 Rs. This is for the person who has the field for himself. After the pattakkoli, for those who do not own the field, the gain is even less. Half of the farmers are now such paattam farmers and not owners. For one hectare paattakooli is from 17500-30000 Rs. Paattakrishi people are agricultural laborers.

The mean production of Trichur Kol fields is 2 tons per Acre. According to current price of paddy the gain is 22000 Rs /Acre.

Ploughing(600), making varambu(600) Sowing(300) Cost of seed(850) fertilizer(2500) Pullumarunnu(1600) protection of plant(800) Reaping(2000) Transportation(8000 and total expenditure is Rs 10000. The gain is thus only Rs 12000. This is much less for a paattam krishikaaran. Most of the farmers in Trichur Kol mekhala is having only less than 1 acre land. (What is the reason for this? This is not analyzed by the article)

In Palghat district are the most number of farmers and the condition is the same. The only

difference is in the expenditure of labour. Here the cost of labor is much less. By the advent of the Thozhilurappy programme that is fast changing. Unless the cost of paddy is increased to at least Rs 20, the farmer will never be out of debts is the view of

C.K.Ramachandran, the awardee of Nelkathir Puraskara. Oct 20 Tuesday 2009. page 4:-

Only if the seed is good there will be sprouting. The seed given by the state seed authority does not sprout. It has become a common feature. In this August, in Trichur Vadakkanchery this was repeated. The seed given was "Uma" to the model production project Gaalasa and the seed which was wetted to sprout remained as such. Trichur Kol fields in Arimbur and Jubily padavu this repeated. Therefore farmers had to purchase seeds from Tamil Nadu and Karnataka.

Till 20 yrs ago there were two pooval farming in Trichur Kol fields. The first pooval is with sowing seeds in the land and then making Njaaru (new plants) and this is called Njaattadi. Now the availability of land for making njattu planting is less due to construction works and filling of njattu fields and also due to lack of awareness of how to do this among the new generation farmers. The first pooval is sowing in September and reaping in December. The second pooval is sown in January and reaped in April.

The mattathriveni, annapoorna seeds are not available now. Both agricultural university and the seed authority do not know about the problem of seeds when farmers raise the problem in common meetings. The farmer with his individual facilities can do only one pooval farming. The second pooval gives the food protection of the state. The seed and

fertilizer has to be given by the state if this has to be carried out. The reaping machine should be made available in time. The reaping machine from Tamil Nadu is brought at a rate of Rs 2000 per hour rent. Even for one pooval the farmers are running around for laborers and for machines. The Government promised to give 20 machines and this promise has not materialized.

In Kuttanad 1.10 lakh hectares paddy cultivation is there. 6 lakhs farmers depend upon agriculture alone for livelihood there. In the 90's the productivity was 2.24 per hectare and now it is 4.5 ton. That is a positive sign. But this productivity is not pertaining to paddy alone. Paddy cultivation has declined vertically since the last two decades. These areas depend on nature for cultivation. The problem of labor is severe in Kuttanad. In 1991 there were 11.3 farmers and 57.13 agricultural laborers in Kuttanad. Now the agricultural laborers have reduced to 1/3rd. Machines are required for all agricultural operations because of lack of agricultural labourers. In Kuttanad 35000 laborers are needed for reaping but there are only 10000 now. And the use of machines was suspended by the party of these labourers. This increased food problem and led to rebellion. Now the labor unions are slowly understanding that either machines should be used or, the number of agricultural laborers should be increased. If both are not permitted how can the agriculture be carried out and the food problem of the people be solved? The owners of farms are now giving their fields for paattam. It is by these circumstances the majority of Kuttanad became paattabhoomi.

The storage facilities should be looked into. If the reaped paddy is immediately not

stored it will sprout and become useless. The collected rice has to be given its price immediately to solve problems of the farmers. The farmers have to wait for 3 to 4 months or longer to get their due. In Trichur Adaat farmers bank used to purchase paddy in the fields itself and pay the farmer in the field itself. But after that when Suplyco came the story became grave. For quickening the payment co-operative societies were activated and Government induced interest-less loan schemes through them. That is not success in many places. Though in word 80 % of the cost of paddy is to be given as loan, without interest, this time several co-operative societies did take the interest.

A model was created by Palghat co-operative bank. They gave interest-free loan to farmers and its project for storage of paddy became a model for entire state. In 2009-10 economic year the bank gave 25 crore Rs for the first pooval. The loan was given through the primary co-operative banks. For one pooval the maximum of 50000 Rs will be given as loan. The time for repayment is 6 months. If not possible to pay by that period, an interest of 7 % is taken. The farmers who take the loan gets insurance protection by National Insurance company and the premium is paid by the bank and not by farmer. For those who give back the loan in time a second loan for a second pooval is given. Even if supply co fails to give the cost of paddy in time, if one shows the receipt of having given the paddy to the supply co the 80 % promised of the cost of paddy was given by the bank and in that way the Palghat Bank showed a model to the state. By the interest-free loan distribution paddy cultivation increased in 4500 hectares more and production increased from 2.19 lakh ton to 2.5 lakh ton. This is recorded in the data of the bank.

After paddy cultivation when the fields are immersed in water doing a organic fish farming, especially prawn etc is a way of livelihood for farmers. From 10 acres within 8 months 4.85 Rs worth prawns are cultivated according to Kuttanad development authority Executive Director Fr Thomas Peeliyaani. From the same field per Acre 2 tons paddy is also available. Since this is organic paddy the cost is 15 Rs per Kg. For one acre 30000 Rs. Reducing the cost of production from this (Rs 18000) the gain is 12000 for the farmer. In an experimental basis fish and prawn were cultivated in 50 acres of land this year.

Kuttanaad Package:- 1840 crore Rs is promised for Kuttanad package. The Central ministry gave the permission but after 13 months, it has not been sanctioned by State Govt. This package was recommended by Swami Nathan committee. The first complaint by the state was that the center is not sanctioning it and when it was sanctioned the complaint was that the center is taking vengeance on state. The chief minister said 75 % of sanctioned amount has to be taken by State Govt and that is a vengeance by the center on state. The opposition party said that below 5 crores is the share of state Government and the rest is central share. This argument went on while the farmers were suffering the damage to their paddy fields and their food, after the summer rains of 2008 March. To have the package done successfully the different departments like agriculture, irrigation, revenue, industry, tourism and forestry has to co-operate as a team. But the problem is that such a co-operation is not there in the ministry or departments. The Prosperity committee under chief minister continues as a decorative committee. The advice to make a committee under chief secretary is not fulfilled. Now everything is done

by a high official in Agricultural department and a official in deputation from the forestry department. 276.5 crores project was submitted and 50 crore was sanctioned .Of this the break up is ,4.91 crore for production of seeds (seed authority)

50 lakh for forestation of Paathiraamanal island (To department of finance)

12 crore for Onaattukara paddy cultivation development

4.5 crore for farming of Ellu(gingili)

18 crore for machinery

15 crores for fishery and animal husbandry

The irrigation department is in the process of making their own project for 1100 crores 85 crores for development of coconut farming and 27.3 crore for vegetable farming is allotted.

The package has no participation from the people .though the regional participation is needed it has not been sought for. The same day on page 6 we find the news of the wetlands of Mananthawady being converted to construction sites by real estate people. Saying that paddy farming is not cost effective first to cash crops and then to filling of farmlands for construction work is the trend that we see here .For a person without a house, for the sake of constructing a house a maximum of 5 cent of field was allowed to be filled .But this law is being misused for major construction projects. In Thirunelli resort construction is being done at the expense of fields. The biodiversity areas of ecological importance are thus being rapidly destroyed. the wetlands near Panamaram puzha has to be protected and for that the people had approached concerned officials .This is a tributary of Kabani river. There are several sites of breeding of cranes in these wetlands .Influencing people like Panchayath secretary, Agricultural officers and representatives of farmers etc who are in the field protection samithi, such atrocities are being done. The custom of making use of the samithy for easy availability of sanction for construction work is increasing in north Wynad .the first process is to plant coconut and betel nut tree and make the field look like a garden land and then get sanction.

In Eramangalam Canoli canal remains of butchery, of chicken ,from hotel and cool bar ,barber shop has become a health problem and the nearby wells and tanks also has pollution of water .Jaundice, Typhoid, Rat fever etc are more if this continues and such cases have been reported from Veliyankode, eramangalam .Perumpadappu block P.H.C Co-coordinator Skaria is reporting such cases and health department is seeking help from police to prevent pollution of the canal. In chittoor the first pooval was lost in monsoon floods but no help was given by Government .The reason was if in a limit of one Krishibhavan ,25 acre of paddy is lost ,then only that part is considered as suffering from flood problem .This did not exceed the amount so defined and farmers lost the help from Government. The farmers of Nalleppilly also expected the help but in vain. In kuttippallam, kuppayyan challa, koundankulam, Nalleppilli ,kanakkampaara areas due to rains the njattadi were submerged and destroyed. Village officer and Krishi officer has to give a report after visiting the area of loss. The farmers took them there and gave the request for help. The vehicle charge paid by the farmers was lost. The agricultural department said that only those requests of farmers where the amount of loss is as defined

by the government should be included in the Prakrithikshobha durithaswasa project. The societies of farmers of the area are thus rebellious to the department. The Karshaka congress Chittoor block committee has asked for relief for all farmers who have suffered the loss whether it is under the defined parameters of krishi department or not .Page 8 of the same day reports a positive agricultural picture from Raajaakkad Raajakmaari panchayath. This area had changed its pattern of farming to Elam and vegetables like plantains and sugarcane and cattle feed grasses from paddy .Now it is returning back to traditional paddy cultivation. This is due to co-operative efforts of the panchayath. There had been about 560 acres of fields with two pooval farming here. the change in climate, lack of labourers, lack of production were reasons for the change to cash crops earlier. By this paddy fields decreased to 90 acres .when awareness of ecology problems ,water problems and food problems came ,under the leadership of Panchayath president P.Ravi people started to come back to paddy cultivation. Lst year the help for buying seeds and fertilizers was provided. By the job availability project ,the canals were cleaned and water for irrigation was enough. New irrigation tanks were made .In dry areas plastic water conservation and storage facilities provided for collecting rain water All these could reduce water problems and now the area is again 500 acres of paddy farming .The main fields Of, Kumbhappaara, Manjakkuzhi Njerippaalam, Kooraappaallipady. Mullan thandu, Kulappaarachaal, Kuravila city ,Rajakumari, Kandathil paalam are now getting the facilities of the project. Help for ploughing, buying seeds and for reaping ,and buying machines for reaping etc are under the project plan .The roads were constructed to the fields so that traffic for the reaped paddy is easy. Same day on page 7 we find that the loss by the state Governments Thozhilurappu podiatry per year is 3.65 crore Rupees (report from Kasarkod) and destruction of Kandal forests and wetlands by a private person for prawn farming was prevented by the forest department in Payyannur Kunjimangalam Changurichaalil .The prawn bund was being constructed using J.C.B by the private person .

In Kalyasseri the first pooval was done and majority was pathiru and this was more in fields were the high productive seeds like Uma and Aiswarya was sown. $\frac{3}{4}$ th of paddy had no seed in it when reaped and was only pathiru. There was worm infestation also .Kalyasseri, Morazha, Paappinisseri areas have extensive Mundaka farming .The first pooval was done in between that .The seeds were given by krishibhavan .The farmers did not get even 20 % of the total expenditure on their farming operations.

October 21 Wednesday 2009. page 4.

About coconut gardens according to Skaria pillai of Nallepilly ,the maximum yield from a garden is mean 100 coconuts .And the mean for the state is only 30 ,Nallepilly being the best coconut garden in the state. Even if we take that 100 coconuts as mean production and 80 trees per acre the maximum per year is 8000 nuts .With cost of three Rs for one nut it is 24000 Rs. In an year one can take 8 times coconut produce.

The kooli for climbing :-8-10

Kooli for cutting coconut-5000

Kooli for chumad and pothikkal ,fertilizer, watering, and kila etc make 12000 -15000 expenditure .And thus one years gain is only 10000 Rs .The farmers of kerala are only

such namesake farmers who get not more than 10000 Rs per year. therefore to live with coconut farming alone is out of question. From June 1 to December the demand for tender coconut is less .In other seasons it is better to sell tender coconuts which give more value than mature nuts. The coconut farmers do interim produce in their gardens and live with that .The people who give the trees for liquor production also has gains. In Chittor and Anthikkad this has happened .But in Anthikat the disease of the coconut tops affected the process. For a tree given to liquor production every year Rs 1200 or more is obtained but this is only for a few farmers. This is three times gain more than selling mature coconuts. The interim farming is done with nutmeg ,cocoa etc .Some also prefer rubber. For 2000 nutmegs trees ,17000 Rs /year/tree is the gain of Kerakesari award winner Thachapilly Aravindakshan in Tripprayar.In kasargod bheemanadi paalamattathil Sebastian's view(another kerakesari award winner)rubber is best and he has made a mixture of rubber,vanilla,cocoa,pepper,pine apple,plantains,betelnut tree, and beans in 15 acre of coconut garden as interim produce to make his garden more productive and cost effective.

In Kuttiadi the majority of coconut seeds are collected .This time only 1,65000 seeds were there. Last year it was 1,45000.The fever of the farmers there which has made pains in hands and feet has caused some fear in the minds of people .

When these negative results are being reported there is a strong positive response from Palghat Srikrishnapuram farmer Sankaran Nambuthiri.He has a garden land of 3 and a

half acres only .He says it yields coconuts to lead a respectable contended life according to him. He has been doing organic farming of traditional style even before such a thing and the zero budget farming were ever got popularity. He never uses chemical fertilizers or pesticides in his garden. Even for the rubber in his garden land he does not use chemicals. From one acre he gets one lakh gain per year for rubber. He does tapping, taking milk, and sheet etc by himself and do not depend upon any other person for such jobs .The remaining 2 and a half acres have coconuts,betelnut trees,jathi or nutmeg, vanilla,coffee,cocoa and is a mixture of farming .The traditional way of doing farming by oneself reduced the cost of labor into 1/3rd. He do not cut the shrubs etc in his gardenland.He just crushes them with a stick when they overgrow. there is no kila or making thadam etc .The patta,chakiri,adal etc or waste products are deposited in the garden itself so that they become degenerated and become organic manure .The jeevamritha which is a mixture of cowdung,cows urine, powdered beans and starker is sprinkled once a month in the entire garden land. For this he has made a tank in the garden which can contain 12000 liters.Sankaran Namboothiri points out that a farmer has to love the earth and the farming and not the money which the product brings .Then everything will be solved by itself.(This is probably what we have to learn and practice first.Thiruvalluvar also has said the same. If we practice that we can live with agriculture alone and that was the life of our ancestors which made us the best agrarian economy in the world in prehistoric/historic times before independence. Where did we loose that ?And how ?Try to find answers for that and solve the problem. Do not find fault with some one else. Find out ones own faults and correct .We are then saved. This is what I really want to convey by this book .Thanks to Sankaran Namboothiri for voicing that

opinion and for the five people who made the report in Mathrubhoomi for highlighting this sensible opinion. The five Panjayathana are George podipara, Aneesh Jacob, S.D. Venukumar, K.R. Prahladan, and K. Rajesh kumar).

Same day on page 7 is a news that in Pulloor, the paddy Uma seed is produced in plenty on a hilltop which was leveled in Pullor Edamunda. Five years back the hill was leveled. For years vegetables were grown there. This year when on experimental basis paddy was sown it was a success. The farmer Krishna is also doing farming of gourds, sweet potato, tapioca etc on this hill.

In Monacha fields which was not used for years women of the area did farming in co-operative basis. The seed Athira was used. The farming was done under Kudumbashree. The women had no fields of their own and took fields for paattam and made good produce.

Like Srikrishnapuram another positive note is from K. Kunhimamu of Kannur Kaattampalli kaipaad. Kaippad or karippad is the field of rice. For 40 yrs these were uncultivated. The co-operative farming done in 10 acres of this fields by Kunjimamu and his team is revolutionary. He is the president of Kattampalli project area agricultural farmer-laborer union. There is 515 acres of land which is left uncultivated for 43 years. This is in Chelora, Naaarath, Puzhathi, Munderi, Kolachery, Kuttiatur, and Chirakkal panchayath. 50 people did co-operative farming there. This was done as a lesson for those who say that agriculture is not cost effective. 43 yrs back the shutters of kattampalli project were permanently closed saying that it is the salt water from the sea which is making it

impossible for taking three poovals from the fields. The purpose was to take poovals all round the year. But the effect was opposite. When salt water from sea was prevented the mud stopped entering the fields and the ground became rocky and hard. And dirt accumulated in fields. Only when natural tides and entry of cheru (dirt from sea) come and make the land fertile the produce will be good. This was pointed out by farmers and the shutters were allowed to be opened by their repeated requests. Kunjimamu has cultivated 10 acres. For that 30000 Rs was spent. 23500 Rs and the seeds were given back from Government. He expects produce of 1.25 lakhs from the fields. When he didn't get people to do labor in the field like planting saplings etc he used labor from all the members of his house and thus the production cost was minimal. This was what was done in old time farming of Cheranad and he has repeated it. This is a revolutionary eye-opener. In 6 acres he has Orkkayamma seeds, in 3 acres Kuthiru and in one acre vyttla 6. Since there is enough ferric iron in the red soil no other fertilizer is needed according to Kunjimamu. (Mathrubhoomi 25.10.2009). The old ancestor, Kannur Nambuthiri who wrote a book on agriculture in 18th century, was from this very place and he might be blessing the Kattampalli project and its charioteer Kunjimamu for the love and respect he is showing to agriculture and land and labor on a co-operative basis.

The same day it is reported that in Aroor mandala, western parts Karinila, reaping of paddy has started. 2000 acres were cultivated. Pokkali, chedivirippu and Vytt 6 seeds were sown. Only in a very few fields were Uma, and jyothy and the new HY variety sown. The farmers used traditional chedivirippu and pokkali which are suited for karinila. There is a view among the civil supplies that these traditional produce need not be taken and only

the HY variety will be bought from farmers. If the decision of civil supply is like that ,the producers will be in difficulty. But ,the red tapism of supply co in such matters should be analyzed and channelised in the correct way to enhance food production in the country. The attitude of supply co is detrimental to production increase in the country .It is against national and state interest and against the interest of farmers as well.

Oct 30 .2009 Letters to the editor column has given a few remarks and opinions from the readers about the series on agricultural scenario.Fr Thomas piliyanickal points out that seeds like jyothi and uma have lost their high yielding capacity .His suggestion to have a rice park in each village panchayath if done with proper co-operation from people of the panchayath will work out .If it is dependent on Govt funds it will never happen and even if it happens it will not succeed. He mentions a very pertinent point about the food security based on production in other states is not permanent and that methods to produce enough rice for Kerala is possible .But the method he suggests is involving the Government .In each Panchayath ,if there are co-operative work with all people ,this can be started and the method of getting loans and getting into debts and paying interests is being encouraged by Govt and it is in the long run detrimental to farmers as well as the rice farming activity as such .He thinks that the responsibility to feed the people of Kerala is not that of the farmers alone .And the society and Govt should take that responsibility.

It has been a vicious circle that is created by individual property rights of Kol puncha fields and other fields of paddy growing areas. Because paddy growing cannot be done on an individual basis and the labourers,small land holders as well as Govt is now understanding this fact ,though a little bit late.

C.A .Sheela from Panamaram strongly criticizes the views of Agricultural minister that a culture of agriculture should be created. No help had been given to farmers of Wynad though the minister says it had been given, she adds. She say s when the produce was destroyed in 2008 officials of agricultural dept came and looked at the loss and report given but no help came from Govt.That means the Govt is still following the same code of conduct as noticed by my father in early sixties (Kerala Legislative assembly proceedings).Madhavannunni from Ongallur ,Pattambi says the reason for the problems of agricultural field is the total avoidance of age-old seeds ,cattle, traditional knowledge of agriculture .They were not only avoided but destroyed en root by the new reforms. And from a farmer who loved the fields ,he had been converted to one who fights with the fields. The productivity decrease with such a process. Now farmers are wasting time with papers and requests in the verandas of numerous Govt offices for grievances which will never be solved by such Govts.He says, There is only one method for solution and food safety. The traditional methods of agriculture were formed after experience of millennia with geographical, seasonal knowledge and knowledge of soil and biodiversity and water resources .Know that and then with the modern technological and scientific knowledge strike a balance and go forward. I think his is a practical and sound suggestion for a strong agro economy in Kerala ,the best place where rains, land and other conditions are best for paddy growing in the South India.

Trying to grow more and create a green revolution in places where a climate and resources for good production does not exist (in dry land) is a process of development in such areas. But neglect of an already available land with best climatic conditions for grain production, and converting that for other purposes etc is a great negligence and culpable crime of first order. Both the ruling and the opposition leaders and the people of all panchayaths should sit together and find out solutions in each region/locality. And the peoples participation, love of land and agriculture and expertise and experience in agriculture is the best culture of agriculture. Regain that culture and succeed together is the best motto. Government should see the priority value of food production and the timely help needed for success of farming and should raise to the occasion and reduce red tapisms. And different departments being concerned in agricultural activity they should sort out their problems between them. It is the responsibility of the Government to help people. And it is the responsibility of people to co-operate and increase production and become selfsufficient. No one is free from responsibility. And blaming each other is not solution to problem. Conducting fruitful discussions so that the problem is solved and nation progresses is the goal.

TOI Monday Dec 7th 2009:-

What about the climatic changes in other parts of India, when the kanikonna has started to bloom in October itself (not in the usual April /May) and the reptiles and birds has started to hatch earlier ?

We will look at Darjiling. Usually flowers bloomed there in February and now they bloom one month early in January and the thousands of migratory birds which come miss the season. They are the pollinating agents and due to early flowering chance of pollination is gone. A few years ago in Kurseong and Tindharia thousands of sparrows and swallows came but now only mosquitoes and flies are there. The sathpathri (Saipatri with 100 petals) which bloomed in hills do not bloom now. The Gauthali birds do not chirp noisily and apple of Kullu valley has shrunk due to want of frost. Ginger and oranges are not growing to their great potentials. (10 yrs ago they did). The marigolds of Nepal during Tihar and Bhaitika (Diwali and Bhaidhooj of Nepal) grow less. Steady drying up of water sources, rare bouts of snowfalls are happening which is dangerous to their economy and tourism as well.

In Himachal Pradesh, Shimla the glaciers are melting. The climate change brought down the number of good chilling hours for a good apple crop from 1200 to 800 hours. Now Kullu people requires AC and fans to sleep. Global warming is just one aspect of the problem. Large scale construction, rapid increase in number of population, as well as vehicles have compounded the problem according to the scientists. Deforestation reduced green cover of hills. A vicious circle is created by manmade disasters. According to Dr S.S. Samant, scientist in charge of G B Pant institute a drought-like situation can happen soon. Himachal Pradesh agricultural uty at Palampur says that in 30 years, growing apples will not be possible in Himalaya belt of Kinnaur, Shimla and Kullu districts. According to senior scientist G.C. Kunial in 1965 the apple belt was found at height of 1000 meters above sea level. Now it has receded to 2000 meters. Apple orchards abundant in Bajaura (1000 meters) until some years back can now be found only in Katrain (2000 meters) near Manali. Vice chancellor of Palampur uty (Dr Tej Pratap Singh)

says farmers are shifting from apples which used to pump Rs 1700 crores into local economy, to other types of crops. And he adds it is not just apples but all other crops are in danger.

In west coast the spawning season of the small kili meen is changed. In Karnataka the lost Madhuka bourdillioni is rediscovered and scientists are afraid that it may not survive the climate changes that we are facing in the western ghats. In 1393 when the religion and faith of the Parsis of Iran was threatened by the spreading Islamisation a group of them came to India to protect their fire (which they called the Iran Shaw). They landed in Sanjan in Valsad district of Gujarat coast. This fire was later shifted to Udwada a coastal town near Sanjan in 1742. Now the Arabian sea is about to gobble up the holy fire and its seat. Prof Vyas Pandey, teacher at Anand Agricultural uty says an increase in temperature by 1 to 3 degree has decreased wheat yield from 3546 to 2646 kg per hectare. In Gujarat, the wheat production dipped to 8.31 % due to various reasons. In Sourashtra production of Kesar mangoes went down by 10-15% this year. In 2008 the December temperature increased 2-3 degree C, and in February 2009 it increased 5 degree which delayed flowering of mango trees. Many trees did not bear fruit this year due to this. Maximum and minimum temperatures had gone up across a state which is already in hot state according to Dr Pandey. Though the increase is marginal it has effected drastically the rainfall and crop pattern according to him.

The drop in coconut production was due to salinity ingress, a result of scanty rainfall for the last 7 years. The Junagadh-Mangrol belt showed 30-40 % dip in production. Salinity ingress along the 1600 Km coastline of Gujarat affected 1500 villages until last year. CSPC (coastal salinity prevention cell) say farmers are shifting to cash crops like BT cotton and salinity-tolerant crops. (Yesterday there was a news in Mathrubhoomi that due to the peoples revolt the authorities have broken the Viyyam Kaayal bund protectors and allowed saline water to enter the area and all the fresh water in the kaayal was lost and the paddy will suffer this time. The people instead of being told of the problems of such a procedure and long term dangers are being appeased by the authorities for a short-term escape from problems is what I feel from this.) Gujarat, according to Priyadarshi Shukla, a member of Intergovernmental Panel of climate change (IPCC) and an IIM (A) professor, is the 4th largest emitter of greenhouse gases (GHG) in the country behind only Maharashtra, UP and AP. An average Gujrati's greenhouse gas footprint is 3.16 tones against the national per capita average of 1.9 tones.

By 2020 India has decided to cut 25 % of emission. Along with that we should also take a decision to preserve as much of our traditional greenery, cultivation patterns and food production for a healthy level of subsistence. This has to start at every village with each citizen of India and spread to all nation and world as a model. Then we are saved. A few years ago I had written an article in the Express daily from Trichur about how one can undermine the prediction of Malthus by making more production in food and agriculture and cutting short population. And with a good climate only this is possible. And for a good climate we need to know how to preserve our nature. Nature is needed for tourism industry as well. If we exploit nature just to make it concrete jungles, with our over enthusiasm to have a piece of land and a hut/flat for each one, there wont be tourism also in the country. The old monuments, the peaceful pristine nature, and the basic amenities for tourists we have to give through our own regional and cultural peculiarities

,minimizing destruction ,minimizing constructions and reducing pollution .Each village should co-operatively come forward for this .

History of co-operative land management and problems faced by modern India

The essentials of the co-operative village management according to the first 5 year plan (pp 102-103) are:-

- 1.All the land of the village is treated as a single farm
- 2.Cultivation of entire village organized to secure maximum advantage to village community.
- 3.The village resources well organized and maximum employment provided to owners of land, workers who are non-owners of land, receiving remuneration for work/services, while artisans receive additional returns for rights of ownership of lands.
- 4.Village management body allots constituted blocks for cultivation purposes.
- 5.Adopted when at least 2/3rd of the owners of land or a permanent tenant holding not less than 1/2 of the cultivated area of the village wants it .

According to the Planning commission(Second five year plan pp 206)the village lands will be managed in three ways:-

- 1 Individual farmers cultivating their own holdings
- 2.Groups of farmers cultivating their own holdings
Groups of farmers who pool lands voluntarily on their own interest into co-operative working units.
- 3.Some land belong to the village community as a whole-the common lands, the village site, the uncultivated wastelands available for settlement of landless, the water resources etc.

The main agencies for achieving co-operative village management:-

- 1.National extension service and programme for increasing agricultural production and development of other allied activities.
- 2.Village panchayaths
- 3.steps taken to develop co-operative credit ,marketing,warehousing,processing

4. Programmes for developing village industry

5. For assisting voluntary co-operative farming society.

The reorientation and co-ordination of land policy was initiated in Nagpur congress January 1959. Thus co-operation was visualized as the keystone of the third plan. The development of panchayath-based joint co-operative farms, preceded by development of a network of service co-operatives to function as multipurpose co-operative societies and arrange for credit and marketing facilities was born.

The highlights of Nagpur resolution on agrarian organizational pattern:-

1. village organization based on village panchayaths and village co-operation. Both with adequate resources and powers to discharge functions allotted to them.
2. Future agrarian pattern on basis of co-operative joint farming
3. Prior to this joint farming, as a first step, service co-operatives to be organized throughout the country.
4. Ceiling to be fixed on existing holdings and legislation to this effect completed in all states by end of 1959.
5. Minimum on floor price should be fixed reasonably in advance of the sowing season with respect to each crop, with a view to assuring a fair return to the tiller (uzhavar means the agriculturists).
6. Introduction of state trading in wholesale trade in food grains
7. Every effort to bring the uncultivated land and wastelands to cultivation.
(It was based on these decisions, the co-operative society, one of the first of its kind was formed by the Punneyurkulam village under the guidance of K.G. Karunakara Menon, my father).

In page 463 (Dr C.B. Mamoria) it is mentioned that in co-operative farming, management assistance to cultivators combined with supervised credit, and joint ownership of equipments, offers a way to obtain advantage of better management while still retaining the incentive gained by individual operations. The Ford foundation agricultural production team also emphasized the significance of combining rights and privileges with responsibilities. Nanda committee (Land reform implementation committee 1963 Report in 1964) under G.L. Nanda highlighted the following:-

1. Administrative arrangements for enforcement and supervision –adequate

2. Records of tenants did not exist in several states and were incomplete, or out of date even if existed
3. poor economic condition of the tenant
4. In several states the existing provisions for security of tenants were of interim nature and comprehensive measures to bring them to direct relation with state had to be adopted.
5. The ejectments though said to be voluntary were actually forced
6. In several states the rents have to be brought down to $1/4^{\text{th}}$ of the produce or even less.
7. Although legislation exist for ceiling, the problem of benaami transfers still existed in several states

The fourth plan proposals for land reforms (draft outline pp128-132) :-

1. Records of tenancies to be prepared and kept upto date. Recorded tenant(each) issued a certificate indicating right in the land and rent payable by him/her
2. Rights of resumption to be terminated and permanent and heritable rights conferred on all tenants.
3. To improve economic condition of tenants it is necessary to confer on them the right to make permanent improvements to land and to ensure adequate compensation in event of eviction. Adequate and timely agricultural credit to be made available to them.
4. There should be a high level committee in each state to review the programme from time to time (6 months)so that timely steps taken to fill gaps that come to notice.
5. Each state to appoint a special officer assisted by staff as may be necessary to implement programme according to a fixed schedule to be drawn up by state Government.
6. To lay down measures of adequate management .If the lands under cultivation of private owners is not cultivated the state has the right to take over the management of those lands.

The land reforms programme moved slowly since the people of vested interest found means to bypass legislation. Mhalanobis committee reported that no appreciable reduction in inequality seen between 53-54 and 59-60 despite the land reforms of that period. The land reforms touched only the fringes of the problem of land distribution.

HOUSEHOLDS	53-54 LAND	59-60 LAND
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	HOLDINGS %	HOLDINGS %
Top 1%	17	16
Top 5%	41	40
Top 10 %	58	56
Bottom 20 %	No holding	No holding

Report of the committee on distribution of income and levels of living(Pt 1. 1964.pp 20-21) pointed out that among the causes of failure or only partial success of the programme was that the landlords after the land reforms showed complete indifference to the maintenance of capital works like wells,tanks,and improvements of the soil (which they were doing before)Instead ,they directed the investments /funds in trade ,financial assets ,gold, and silver instead of on land and agriculture. These two were the twofold adverse effects of land reforms which they had noticed even in 1964(and which continues till date ,but now it is with Government help).Both affected agricultural investment and production adversely. American expert Shri Ladenjinsky who studied the agrarian problems of India in five districts (Tanjore,Ludhiana,West Godaveri,Aligarh and Shahabad)said that Tanjore was the worst Land tenure system in India.20 % tenants had oral holdings with no legal records, and though the law was that more than 40 % of produce should not be collected as rent, the landlords were taking more than 50-60 %.Eviction for repayment of rent was common.

16th National sample survey report No:122 said that 6.95 crores of households were in rural India and 28 % of them do not own land.24 % has only less than one acre. That is half of the rural household had either no land or below one acre. Their share only 1 % of the land owned by all the rural households.

3/4th of households-no land or below 5 acres of land.

Their share is 1/6th of the total.

1/8th of the households =more than10 acres. Their total share 2/3rd of whole area.

1 % more than 50 acres. Their share 1/5th of whole area. Estimated average area owned for all households would be 4.8 acres.

(Compare with the figures for Punnayurkulam)

It was during this time the Bhoodaan,gramdaan and Prakhandan(Block)movements were started .Bhoo (earth/land)dhaana(donation) or voluntary contribution of land by the haves to the have nots was its mission. In ancient India the practice was to give away land as gift or charity for favor of God as a good deed and Vinoba bhave based his philosophy on this.” Land is the mother of all and everyone has a right to serve her”Vinobha bhave said. The free gift of the earth, its water, air and other natural resources for all to enjoy by God was to create a nonviolent atmosphere and sharing with the poor the wealth of the rich. It was an economic revolution by consent and not by coercion and a new chapter in the socioeconomic reconstruction of the country. The philosophy was simple and traditionally acceptable ,and people readily responded and this modeled the sarvodaya principle.

Sarvodaya life style :-

- 1.Simple life style ,with contentment and happiness which every human being seek.
- 2.The ever-increasing wants of human greed can never be satisfied by the limited supply of material goods. This leads to exploitation of others, and accumulation of wealth in some people. Inequalities are due to this. When there is concentration of economic power in some ,all evils attached to it also accumulate. To break the vicious circle one has to reduce one's wants. And know how to get satisfaction from the available material resources and share them with others.
- 3.The all-round real progress is material,intellectual,and spiritual and all the three should progress together. A harmonious combination of spiritualism and materialism with all the advantages of socialism and without its side effects .It avoids economic power in the hands of the few and it gives utmost freedom of thought to every one (Individualistic) and is not having a control of intellectual thought as there is in present day cadre party politics .

Why Bhoodaan?

The chief problem of the world is agrarian and solved in different ways by different countries. In Russia it was solved with force and bloodshed. China also followed the same way. In Cashmere abolition of Zamindari was done without any compensation. In rest of India it was done with compensation.

In India the problem of food production is linked to the economic sphere. The grow more food campaigns in the first five 5 r plans were because of this recognition. The rehabilitation of the landless agricultural laborers required early action and the Governmental process was slow due to several red tapes. So for a noble end ,and as a means for a fair and lofty ideal Bhave launched the movement. It tackled the problem in all fronts:-

- 1.Abolition of landlords
- 2.security of tenure
- 3.Land reform enactment
- 4.Ceiling on land holding

Vinobha bhave also introduced a fifth one .The spirit of renunciation based on love and sacrifice started the campaign. Ironically it started in Telengana on April 18 ,1951 where later on violent movements also started .The first donation was 100 acres by V.Ramachandra Reddy and it was distributed to Harijans of Telengana.Vinobhaji also advocated along with bhoodaan,sampathidaan(donate wealth),koopdaan(donate

well)Grihdaan(donate house)sharamdan(donate free service)Budhidhaan(donate intelligence)grandhadaan(donate books)and jeevandhaan(donate own life for a right cause).Vinobha bhavé's aim was 5 crore acres so that every rural family has a piece of land to cultivate. What legislation could not do, his yagna could do. And it avoided feelings of selfishness, hatred ,suspicion, and class conflicts between people and therefore was most beneficial to the society. Its international implication was farreaching.The face of nonviolence in solving social problems patiently and with perseverance was demonstrated by his experiments.

As a child I had attended his camp in Punnayurkulam and feel proud to be part of that movement in some way.

Objectives:-

- 1.Keep away from power and create Janasakthy or self-reliant strength of the people.
- 2.Janasakthy is the moral might or force of love or Athmasakthy.The medium is love and not mere empty lip-service. Love is accompanied by sacrifice for the loved one. Here it is love of entire living things and sacrifice for them. What we call Nishkaamakarma in the Bhagavad-Gita .He was interested in the Anaasakthiyoga of Geetha.
- 3.For the sacrifice the Bhoodevi (the five elements) which belongs to God and hence to all alike and to the society as a whole is made a symbol.
- 4.On this basis one can bring about a peaceful agrarian revolution .
- 5.He did not beg for the gift. But for the share for all who are rightly entitled to it.
- 6.Propagate the right thought by which land ownership and economic maladjustments can be corrected without serious conflicts.

There were Pradesh bhoodaan committees in respective regions and the land gift deeds were prepared in duplication duly signed and attested by witnesses ,collected by Pradesh committee and forwarded to sewasangha,sewagram for signature of Bhava before redistribution. Pradesh committees had local committees who appointed individuals to collect the land gift deeds .The representative of Bhoodaan committee, District magistrate ,chairman of village panjayath had to sign the deed and no fee was charged from the recipient of the land. Within three years the recipient was expected to start cultivation and he has to cultivate for a minimum of 10 years .At the spot donations also were made in some cases. The bhoodaan land came under legislation in AP,Bihar, Gujrat,MP,Madras presidency,Mysore,Orissa,Punjab,Rajasthan,UP,Delhi and Himachal.Gramdaan special legislatives were in Assam and Rajasthan.

Upto end of October 1965 , 42 lakhs acres donated .Of this only 11 lacks could be distributed. Highest % of land distribution was in Bihar More land was donated in Bihar

,followed by UP,MP,Andhra,Himachal,Orissa,Maharashtra,Gujarat and Rajasthan. In AP,Assam,Kerala and Madras the Governments provided advancing loans for development work in gramdaan villages and subsidizing special sarvodaya co-operative societies in villages. Since Jan 1957,the emphasis shifted to Gramdan which started in hamirpur dist in UP. The best organized was in Koraput dist in Orissa.Upto 1967,only 39672 villages received as gramdaan.It was superior to Bhoodaan movement since it applied sarvodaya principle not only to land but to entire life of village community. It was easier with that to achieve Bhave's aim of sarvodaya samaj and to correlate bhoodan movement with the economic policy of the nation. The second plan recognized the practical success which is achieved with gramdaan villages will have great significance for co-operative village movements.

Villages were covered as blocks called a prakhand.These later developed under a block development officer and a project implementing committee officer under the supervision of the district collector for community development work .

There had been several restraints for the success of the programme.For example, a land which is fertile and with facilities of rain/or river irrigation about .78 acre(less than one acre) is superior to a land holding of 7 acres which is desert area. And just by the area of the land we cannot assess the equality. The person who receive the land was tested only for landlessness, not for whether he wants the land ,or whether he is capable of doing cultivation ,the capacity of him to till land and make produce etc.There were criticisms but they were more related to implementation of redistribution which was the responsibility of the respective state Governments and officers.

50 % land donated was having some litigation and 70 % of total collection was infertile land .The movement had a negative effect. It created a land hunger ,instead of avoiding greed for land it increased it among people .This was a burning fire which the nation could never suppress because even now it continues .Suppressed fire when it burns is dangerous to a nation.Vinobha Bhave thought that by this movement he can do away with the violent communist movements.% of land collection in predominantly communist areas(which are fertile lands of Bengal and kerala)was less or insignificant than in the noncommunist areas. What it aimed at was never attained. Only 8 % of its expected land was collected at the end of 1961 March.Eventhough such criticisms exist ,the experiment showed the principles on which India was working for millennia and how it can be recreated if people are made aware of the benefits of it and the state give proper support for rehabilitation

The preindependent rural indebtedness summarized.:-

Deccan Ryots commission	Year 1875 Rs 371 /occupant only	Analysis of 12 villages in Ahmed nager district
Famine commission	1880. (not specified)	1/3 landholders in deep debt. Another 1/3 in debt but with power to redeem the debt

Sir Fredrick	1895 45 crores	Madras alone
Famine commission	1901	¼ lost land in Bombay. Less than 1/5 free from debt
Sir Edward Mclagan	1911 300 crores	For British India based on estimate of Nicholson for Madras
M ,L.Darling	1925. 600 crores	Based on Punjab figure of 900 crores
Central banking enquiry committee	1929 900 crores	Based on provincial banking enquiry committee report
P.J.Thomas	1933 2200 crores	
Dr A.K.Mukerjee	1935 1200 crores	
Agricultural credit department	1937 1800 crores	
Mr E.V.S Menon	1938 1800 crores	

The figures for the whole Indian union after independence :

Dr .S.N.Naidu	1100 crores
National income committee	913 crores
S.Thirumalai	1800 crores

Rural credit survey of RBI (1951-52):-

- 1.Proportion of borrowing families in India 51.5 %
2. 63 % rural families in debt. Average debt per family was Rs 283 only.
- 3.The higher burden was in cultivators with small holdings.
Rs 300 /small holdings on average
Rs 1000 for the large holdings on average
(Debt was more for the large holdings)
- 4.Average outstanding debts per family was Rs 29-Rs 1200

Rural credit follow up survey (56-57) found an increase in volume of debt in this period.

1.65 % agrarian labor families indebted in 1956.as against 45 % in 1950.Average debt increase from Rs 47 to Rs 88.

2.Average debt per indebted family rose from Rs 105 to Rs 133.

3.Total estimated volume of indebtedness of agrarian labor families Rs 143 crores in 1956 against 80 crores in 1950.

All India rural debt and investment survey of RBI(1961-62):-

1.Average debt per household Rs 654 More for cultivators (Rs 719 per house)
Noncultivators Rs 429/house

2.Markedly high in Punjab,Rajasthan,Gujrat,Andhra,Madras and Mysore
Low in Bengal,Kerala,Orissa,Assam and J&K.(This is interesting. Because except JK al other states with low debt rates are rice producing states and suppliers of staple food to the country and yet they are comparatively free from debt .This point needs special mention.)

3.Examination of outstanding debt of cultivation in relation to their cultivating holdings revealed that incidence of debt per acre was highest in Madras followed by Kerala ,Andhra and Bihar.(Note this point also. The debt of these rice producing places was directly related to production cost whereas in the other states it was not.)The debts per acre of cultivated holding exceeded Rs 100.The debt in this category was very low in MP,Rajasthan,Maharashtra ,Orissa and Assam.

4.The burden of land debt varied with land size and assets. Debt per acre showed a steady increase in as the average size of the holding declined ,that is the smaller holding ,the larger the debt per acre. The average debt formed 5 % of assets of the richer farmer ,9 % in the smaller farmer

The Banking Enquiry committee found that the debt was for productive as well as for nonproductive activities. Rural credit survey committee(RCS) :- In a noncultivator family the expenditure accounted for 70 % debts .Nonfarm business expenditure accounted for a 5th and other expenditures for balance of total borrowings. For a cultivator family, the family expenditure was only 47 %.The capital expenditure on farm was 32 % of total borrowings.

RCSC Report .Borrowings of cultivators classified according to purpose and duration

Purpose/Duration	Government	Co-operatives	Others	Total
Agricultural				
Short term	2.8	11.3	85.9	100
Long term	6.0	2.4	91.6	100

Nonagricultural				
Short-term	-	0.5	99.5	100
Long term	0.6	-	99.4	100
Consumption				
Short-term	2.1	2.2	95.7	100
Long-term	1.0	0.9	98.1	100
Replacement of old debts	0.8	8.7	90.5	100
others	0.8	2.4	96.8	100

More than 80% of short term agricultural debts and more than 90 % of long term agricultural debts were from private agencies. Half of the borrowed fund utilized for unproductive family expenditure. A little less than 1/3 rd only on farm improvement .It is noteworthy here that the Reserve Bank of India had classified rural agrarian credit as short term, medium and long term on basis of the return of credit as well as purpose of the credit taken as below (Preliminary report in 1936) and the classification in the above table does not show the term medium ,but actually the long term mentioned in it is the medium credit .(The long term credit is mainly for making lasting improvements like provision of drainage systems ,construction of wells ,embankments ,granaries and storehouses etc and litigation and repayment of old debts and the duration is for 15-20 years and this was previously the duty of the zamindar or the local kings and the funds came from peoples cooperatives as temple offerings and the emperor as trustee and the Guru or Brahmin as the surety .)All these are needed in different stages of farming and the RBI pointed out in 1936 that the long term credit is more important and if effective steps are to be taken to make the agricultural credit worthy ,this is the first problem which is to be tackled.

The purpose of borrowing as % of total borrowing is given in the following table.

Purpose of borrowing	All India	cultivators	noncultivator
Capital expenditure on farm	27.8	31.5	6.0
Current expenditure on farm	9.3	10.6	1.1
Family expenditure	50.2	46.9	69.9
Nonfarm expenditure	6.6	2.5	18.5
Others	5.7	6.0	4.4
More than one purpose	0.4	0.5	0.1
Total	100	100	100

46.9 % of total debt was for consumption and not for productive expenditure The split up of this was ,24 % for social purposes,19 % for productive purposes and 1 % for

miscellaneous items. Large part of debt was unproductive. In 56-57 about 92 % of debt was for private agencies.

To other agriculturists	24.9 %
To professional money lenders	44.8
To relatives	14.2
Landlords	7.5
Traders	5.5
Commission agents	5.5
Government	3.3
Co-operatives	3.1
Commercial banks	0.9
Total	100

Needs to satisfy which the loans were needed by the agriculturists:-

1. Conduct of productive activity at normal levels of efficiency.

Seeds, manure, wages etc. Production needs like livestock, implements, payment of rent, revenue, current consumption finance (food for family)

2. Development of conservation of resources Ordinary long term development of long-term resources left unutilized in course of the current productive activity-construction of wells, tanks, embankments, trees, orchard planting etc

3. Circumstances of calamity or distress occasioned by famines, floods etc. This would be above all the requirements of for ordinary production needs and consumption needs.

Causes of debt:-

1. Ancestral. As a pious obligation to the forefather's debts

2. Subdivision and fragmentation of holdings. Skill, industry and thrift are needed to support a family upon a few acres. (The joint family system was doing this efficiently and whole villages were managed by a few guilds of workers and families. It was to prevent fragmentation of holdings as individual property, and because of this co-operative holdings only the whole village was prospering)

3. Vagaries of climatic condition and natural calamities

4. Ignorance and illiteracy of cultivation

5. Failure to provide for deficiencies. Agriculture is subject to law of diminishing returns (Manure, water, seeds, soil, methods of cultivation). Poverty, tiny plots, and ignorance of cultivation and climatic peculiarities leads to a diminishing return. (The individual/co-operative farming and its value as well as climatic conditions were well studied by all cultivators before independence. They might be illiterate but they knew the crops, the

seasons and economy associated with them)

6.Low income and hand to mouth existence

7.Money lenders and the vicious system of debt

8.high rate of interest

9.Extravagant and improvident borrowing Marriage ornaments, funeral rites, which are beyond their means. Long seasonal feasts ,kasha observances etc (These observations are not entirely correct as we will discuss in a further chapter)

10.Maintainance of law and order

The king or Zamindar was the chief security to the land. The spare produce went for the military expenditure and the agriculture suffered after the 18th century .

11.The litigations (vyavahaara)increased after the Foreign laws were enforced and individual property right was recognized and this resulted in ruining of funds as well as the social co-operation

12 Heavy burden was the land and irrigation tax. In 1901 the rigid revenue system forced the people to borrow.R.C.Dattha(1901) said that it made people impoverished. Heavy tax and rigid procedure of its collection increased peoples indebtedness.

13.All the marketing facilities which were existing in the previous system of guilds were lost .

The legislation recognized “Debt of its people as a symptom of deep-rooted disease and took some temporary measures to control and eliminate it .These were

1.Legislation for scaling down the debts

2.Restricting the activity of the moneylender

3.Fixation of rate of interest

4.system of registration and keeping compulsory accounts

But it also recognized that the long-lasting remedy is:-

1.Spread of education

2.Extention of co-operative and joint stock banking

3.Training the borrower in the habits of thrift and saving

4.Agriculture to be made more productive by consolidation of holdings

5.Establishment of subsidiary occupation when there is no agricultural activity

6 population control and reduction of family expenses

The rural credit survey of RBI in the early sixties described the co-operation as a failure on the grounds that the rich cultivators were sulking away the bulk of the cheap co-operative credit and releasing it privately to small cultivators at exacerbad rates.53 % of small cultivators were getting only 11 % of co-operative credit in comparison to the rich ones (13 %).The asset of the former was Rs 2500 and asset of the latter 10000 Rs and above who are taking 55 % of co-operative credit.

Small cultivators	Large holding cultivators	% increase
53 %	55 %	2 %
11 %	13 %	2 %
Asset value Rs 2500 or less	Rs 10000 and above	Difference Rs 7500

The question why this increase amount of credit to big farmers with more assets was answered ,:They are able to raise a marketable surplus .The Government policy was thus raising the surplus market .The production and income of the small scale farmer had to be gradually raised and their natural output share had to be increased and that was the aim of the co-operative (as it was from time immemorial in Rural India)and this did not happen was the RBI report. The recommendations of the Rural credit summary committee was followed by the recommendations of the committee on co-operative credit in 1963 .It suggested organization of co-operatives on the basis of village community as primary unit ,ensuring state participation in share capital of primary agricultural credit society ,co-operative society membership to all classes of cultivators, short and medium credits without mortgage of landed property and credit limits for central co-operative banks liberalized to obtain larger funds from reserve bank. The Government /state agencies provide finance indirectly or directly. Indirect credit was through the co-operative society.(Reference :-K.Madhavadas.Governement financing in India. Agricultural co-operative credit in S.E.Asia 1967. pp 174-175).It is worth stating that K.Madhavadas was a native of Punnayurkulam ,a nephew of my father, and husband of my cousin late Madhavikutty.

The Government representative on board of Banks and societies was limited to 1/3rd of board or three Government nominees whichever is less. Thus Government was playing a complimentary role to RBI in the development of co-operative credit. Direct financing to farmers by Government had a very long history in India and this was called Taccavi loans and based on it the British Government had Land improvement Act of 1883 (for long term loan)and Agriculturists loan Act of 1884(for short term loans).The 1883 Act was for construction of well, erecting embankments ,irrigation work, protection of land from floods and erosions and was for 25 years or more and the landed property was

given as security at rate of 6 to 6 3/4th and loan repayable at equal installments discharging by principal and interest. The 1884 Act was for current agricultural expenditure including the rebuilding of houses lost in floods and had to be repaid after the harvest.

In 1957-58 Government spent 258 million Rs with 0.06 % interest and in 60-61 Rs 421 million. In these years Govt loans through co-operatives was limited to only three states. The Government loan recovery was like the tax on land and yet there were continuous overdue (since this was the rule in India even before British rule and the rulers were very lenient in it, before they were pressurized by the foreign regime to collect it or evict). In 60-61 in the three states it was above 80 % and 50-80 % in another 6 states. The taccavi loan had very long terms of repayment (which the people considered as ancestral loan and continued to pay before and the rulers allowed overdue) and very low credits.

In modern India the RCS committee noticed that Govt loans of taccavi nature was tending to gravitate to the big and large landholders since their borrowing capacity was four times that of the medium and ten times that of the small cultivators. Thus it was taken by those who least need it. The RCS Committee general report directed the government loan to periods of disasters like famine, food scarcity and floods and a co-ordination between it and co-operative credit. (Report of the committee on Taccavi loans and co-operative credit 1962 pp 83)

Its main suggestions were

1. Government loan to co-operative banks at interest rates which enable banks to keep adequate margins between these rates and the rate at which they lend to the affiliated primary credit societies
2. Before Government provide funds the question whether the co-operative credit structure is able to undertake the responsibility should be examined, because a weak co-operative credit structure will find itself in a further mess if it takes itself this additional function
3. The loan should be timely from February to May.
4. The financing should strengthen and not weaken the discipline of co-operative credit structure. In federal co-operative structures the Govt loans are to apex banks and not through central bank or a local society.
5. Terms and conditions of Govt loans were specific, clear and carefully considered by co-operative banks before acceptance. For selection of area where the policy of distribution of Govt loan to be done, the cooperative apex body was consulted. Full freedom given to co-operative bank and society in dealing with individual loan application. SBI and exchange banks had a commercial function and played little role in

Government loans(less than 1 %) and they financed the trade, to estate agriculture and to areas where production is for market (just like the British period)and their indirect finance of agriculturists was through merchants and dealers (as in the past Indian history).Give loan to merchants ,commission agents on security of agricultural products stored in a place approved by them at 6 to 9 % interest in the movement of the produce from the Mandis to the consuming center /or different parts .Stocks so pledged were insured against fire, and bank require insurance against additional risks like floods .It is kept under lock and key by the bank subject to periodic inspection by a bank official.(All these were done in the pre-British system by the erstwhile rulers and merchant class and Brahmins and the entire people of the country and was not new. The system just changed hands but survived with its own faults and advantages which we will discuss later). The security of gold and silver and ornaments and other articles like produce of the temple lands called Nidhi (treasures)by the old economists were existent and the British saw such nidhi in Madras and Andhra and devised the law in their model.(Padmanidhi ,Samkhanidhi etc in relation to Vishnu temples).The mutual loan societies (called chittikkuri /changhathikkuri in the south. See Logan's manual) had gradually developed into a semi banking institution for mutual help and this was to facilitate savings ,relieve members from old debts, accumulate funds for loans for emergency purposes for all members of community. There were several distinctive features of considerable value in this system. It encouraged thrift, mobilized small savings, promoted co-operative effort, inculcate in the members a habit for punctuality and planning for future expenditure. It was based on associations, confidence and honest dealings and these were existent in India for co-operative living and agriculture and this system ,though criticized by the foreign merchants, administrators and military in initial stages were taken up by them and used for improvement of their trade, administration and military shows its utility value as well as strength.

All such systems were incorporated into the new nation in its initial economic and agrarian policies. The rural credit survey found(1951-52) certain salient points existing in different regions of the country.

- 1.Proportion of dormant societies were more in West Bengal and Bihar
- 2.Proportion of rural population covered by cooperatives was very low in Bihar, West Bengal and Rajasthan.
- 3,Resource position and level of advances was poor in these three states.
- 4.Proportion of co-operative borrowing to total borrowing was highest in Maharashtra and Gujarat ,and followed by Madras presidency and AP and Punjab. Very low in Bihar and Rajasthan
- 5.While advances were low ,proportion of overdue also was high in Bihar and West Bengal.

These suggested that the co-operatives were well developed in Maharashtra ,Gujarat and

followed by Madras and Andhra(The western and southern India) and very low in Bihar ,Bengal (The Eastern India) and Rajasthan(this being not an agrarian state its condition is different).Punjab and UP had an intermediary position.

When we assess the conditions of one region and apply or project the theory onto another these factors are applicable. What situations prevailed in these states in preindependent and independent India and at present should be seen in continuity ,not projecting everything as a wastebasket theory of one or another type, is the lesson from this. If poor conditions existed in Bengal and Bihar then, how it continued over the years and perpetuated by whom and why is also another side of the coin to be considered which is not in the scope of this book.

It was on the basis of recommendations of V.L.Mehta committee on co-operative credit (1960) the agricultural refinance corporation of the second plan was formed .

RBI ADVANCES TO STATE CO-OPERATIVE BANKS IN CRORES OF RS

Year	Advance	Outstanding
1951-58	11.29	7.81
55-56	23.80	12.98
59-60	100.65	74.54
60-61	146.66	89.40
61-62	192.92	122.80
62-63	220.28	134.32
64-65	283.49	148.63

The launching of intensive agricultural production programme was launched in 1960-61. The principles of co-operative movement was not new in India as we have seen. Since ancient times it was practiced in various ways. The joint family system (brotherhood, mutual help)the panchaayaths,(principle of community self help) nidhi in temples (based on mutual association, confidence and honest dealings) existed for millennia (Mamoria C.B.and Saxena R.D Cooperation in India.1960. pp82-83).The theory of co-operation in India meant better living for all and for moral upliftment of all. The Mclagan committee report on co-operation in India (1915 . pp 2) observes:-“By the union of forces material advancement is secured ,and by united action self-reliance is fostered ,and it is from the interaction of these influences that it is hoped to attain the effective realization of the higher and more prosperous standards of life which has been characterized as better business, better farming and better living”. Basically the approach touches upon all aspects of life. The means for raising productivity ,improving technology ,expanding employment and basic necessities of every member of the community. The features of the ancient co-operative societies were

1.Organisation of free individuals in self-regulated action ,emphasizing the idea of self-help ,act of association being both voluntary and a recognition of equality as Athman

/God's children.(Swaathanthrya,karma,swadharma and samathwa as yoga).

2.Economic benefit was secured through trading and commerce in the widest sense as dharma(Vaaniyadharma,and Arthasasthra)

3.It is not a seeker after a particular or sectarian privilege but one who conducts business as dharma for the benefit of all in an unselfish spirit(Nishkaamakarma) who was respected. The motto was each for all and all for each.

4.The co-operation was concerned with the user, his dharma and honesty ,not on his wealth or asset ,for benefits to society are commensurate with the use made.

4.It decreased destructive competition among its members by this principle

5.It enabled the realization of advantages of large scale operations

6.Helped to pool the resources of people with small and limited assets and obtain the benefits of strength through unity

7,Created the feeling of self-help and solidarity and enable its members to resist exploitation not by social and political upheavals but by circumventing the channels which lead to such exploitation

8.It combined the high aspirations of calm and strong decisions and strenuous actions. It sets itself to develop the spontaneous energies of the individuals(based on their three guna)while training them to collective actions by the aid of collective resources and for attainment of collective needs.

Early phases in British India.

Here I just point out some attempts by the British legislature to understand the problems of India and to give help if possible.

1.The recommendations of the famine committee 1901 .Sir Edward Law's committee which lead to Indian co-operative societies Act of 1904.

2.Co-operative society Act of 1912.

3.Committee under Sir Edward Maclagan 1914.Report submitted in 1915.It was an important landmark in the co-operative movement and had made several observations on the rural credit societies. The salient features he pointed out were

A. They know the co-operative principles and have proper selection of members

B.Honesty is their chief basis of credit

C. Dealings with members only

D. Loans are not given for speculative purposes

E. Scrutiny before advancing loans and vigilance afterwards exercised

F. Ultimate authority is in the hands of the members, not in the hands of the office bearers

G. Encouragement of thrift and constitution of an adequate reserve fund aimed at

H. Only one vote for one member and maximum publicity in the society is allowed

I. Capital raised as far as possible from savings among the members and neighbors

J. Punctual payments of loans adhered to.

He also noticed the defects in some regions as follows:-

A. Illiteracy and ignorance of masses

B. Criminal negligence of the managerial committee and staff, misappropriation of funds, frauds

C. Nepotism in advancing loans and punctuality being not enforced. (very lenient)

D. The delay caused in lending support drives people to moneylenders in agricultural operations.

E. The working of society on mercenary grounds under a registrar of co-operative societies have no humanitarian concerns.

(These are important features and to be compared with our own conditions still existing)

4. The Government of India Act of 1919. By this co-operation became a provincial subject.

Followed by Co-operative society Act of Bombay 1925 Of Madras in 1932

Of Bihar and Orissa in 1935

Of Coorg in 1937

Of Bengal in 1941

Other provinces followed the central Act of 1912. Rapid growth of movement occurred between 1919-1930 and Mr Ramdas Pantulu called it the period of expansion (pp 555-

556 Mamoria 1969).

5.The period of depression and after (1928-35 to 1945):-

1929-33 saw the great depression. It was a rude shock to the movement .The prices fell sharply. Heavy burden of debts on people and they lose interest in the movement .In 1937 a new Agricultural credit department of RBI was set up which stressed need for multipurpose co-operative societies. With second world war ,the growth of consumer stores and marketing societies ,milk supply unions ,motor transport societies ,fruit growers and cane growers associations came up. There was large turn over, accelerated payments ,shrinkages in overdue and societies gained strength and vigor once again. In 1945 the co-operative planning committee was appointed to bring 30 % rural population and 50 % villages within the ambit of a reorganized society within a period of 10 years (by 1955).This urged the RBI to provide greater assistance to the co-operative societies. Therefore what we see as a post-independent process of co-operative movement is as old as India itself and has a continuous history to trace.

POST INDEPENDENCE PERIOD

The 15th conference of registrars of the co-operative societies recommended the linking of credits and marketing. Assistance for construction of godowns where the rat and damp will not destroy the grain was asked for.(This is the old granary of Mohanjodaro,the ara /pathayam etc of the kerala agricultural people).They also recommended setting up of processing plants by grant of liberal loans and subsidies and the necessity for training the expert staff .

Rural banking committee(1949-50)suggested formation of rural co-operative banks and expansion of urban banks, central banks and provincial banks to serve most of the needs of the rural area. A major development was in 1951,the appointment by RBI of a rural credit survey committee(RCSC) which submitted report in 1954.It noticed substantial deviation from co-operative principles and policy .It concluded “co-operation has failed but co-operation must succeed”.

The reasons for failure were functional and structural deficits ,administrative deficits and dearth of suitable personnel to conduct the affairs of the society ,lack of training ,background of mass illiteracy ,and deficiency of communication networks in villages, and also storage and other vital requirements. It recommended an integrated scheme with three fundamental principles for rural credit.

1.State participation at various levels

2.Co-ordination of credit and other economic activities especially processing and marketing

3.Trained and efficient personnel responsible to the needs of the rural population should

be in the administration.

It also recommended the nationalization of the Imperial bank of India to undertake marketing and processing of co-operative societies. In March 1955 ,the recommendations were approved first by the 2nd co-operative congress in Patna and later by the 1st conference of ministers for co-operation in 1955 itself at New Delhi. These recommendations were the basis for the second five year plan .(Also refer The Ministry of community development .Panchayathi Raj and co-operation sahakaari samaaj 1962 pp 48-52) .In the second plan building up of a strong co-operative sector was one of the central aims of National policy and pilot projects had to be undertaken on co-operative farming and co-operative societies. It is here the earliest pilot projects done at Punnayurkulam in these lines by the initiative of .K.G.Karunakara Menon is significant.

The National development council resolution(1959) said the basic objective of the co-operative policy was rebuilding the rural economy and increasing agricultural production. A working group was set up under its recommendations in 1958 for implementing its resolutions. The policy letter of 1959 May states the salient features of the policy as:-

- 1.Organisation of village community as primary unit
- 2.Societies to function as multipurpose societies
- 3.Organisation of the new and revitalization and reorganization of the old societies to be Taken up immediately
- 4.Village panchayath and co-operative society should be co-terminus to their jurisdiction
- 5.Loans on basis of purpose ,not on basis of property
- 6.Membership made universal
- 7.Co-operative marketing,storage,processing accelerated and expanded
- 8.Staff of co-operative departments strengthened and adequate arrangements made for Training
- 9.Movement must be in hands of nonofficial
- 10.Takavi and loans channeled through co-operatives

The functions of village panchayaths and co-operatives were clearly demarcated with full co-operation between the two. The board cannot nominate the chairman. The board chairman should be an honorary worker and a popular leader with enthusiasm and ability of integration .The interest was at uniform rates. The activities of the co-operative

was supervised by the supervising unions and state Governments and local defects rectified by them. These gave proper timely support and help to rural population. The Mysore conference of state ministers of co-operatives (1959 third conference) was followed by setting up of an expert committee on co-operative credit under V.L.Mehta (reported in May 1960). The 4th conference was in 1960 at Jaipur and working group of Panchayath and co-operatives under chairmanship of S.D.Misra was formed in 1961 to study the panchayathi raj and the co-operative movement in detail. In the 5th conference at Luck now the committee for co-operative administration (1963) was set up. It was under chairmanship of V.L.Mehta.

The 4th plan gave emphasis to consolidation, elimination of existing weaknesses and a viable co-operative credit system. Programmes for high yielding paddy and high fertilizer responsive seed programmes were resorted to. It tried to strengthen the co-operative in fisheries, dairy and animal husbandry. And it studied the areas where the co-operative movements were failure (Bengal and Bihar and Rajasthan). The people were still considering the Government as the totally responsible body for whatever they go through (Registrar as representative of Govt treated as Brahma, Vishnu, Shiva of the society pp 578). They were too illiterate to understand that they too are responsible partners in the movement. The problem of greedy moneylenders and intermediaries still persisted and the needs of the agriculturists was not totally met with. The uneven development in different states were due to the prior conditions of the development, the nonofficial leaderships available, the presence or lack of official imagination and vision, flexibility of rules and procedures, nature of economy, level of thinking, savings and assets available, land ownership patterns and distribution etc.

The co-operative credit system was reorganized in two parts.

1. The short and medium credit as a three tier system
2. The long term credit

The three tier system:-

1. The apex bank (in some the entire state is the apex)
2. The central bank (the district)
3. The primary agriculture /credit society at village level as the base

The long term credit:-

The central mortgage bank for each state at apex level

The primary level mortgage bank at Taluka /District level

In Kerala state in 1965-66 the movement was developed well but had still to make an

impact on rural economy but the foundation stone was laid very strongly.

There were 2104 societies ,and the membership was 1238000,share capital in Rs was 428 laks,deposits were 443 lakhs and loan advance during the year was 1197 lakhs and percentage overdue was only 21 %.

The story of Punnayurkulam and its co-operative movement and farming experiments in kol puncha in the period of 1947- 1969/70 is worth mentioning since it is the most rice producing area in entire South Malabar and after this period this potential is neglected /or not tapped properly by any of the subsequent state Governments .The laws are implemented with machinelike accuracy and the results awaited ,but no sincere efforts to revitalize the agrarian production has been undertaken after 1970.This is where the present study is important.

Community development programmes and reconstruction of rural areas in preindependent India were experimented in Bengal at Sriniketan (Ravindranath Tagore) ,Marthaandam project (in 1921 by the Travancore Rajah)in Baroda(1931)and Gurgaon.The Firka development in Madras presidency was based on Gramaswaraj which merged with the National Extension Service(NES)in 53-54.It was a co-ordinated project of agriculture ,food and nutrition related to public health and veterinary science ,industries and communication .The sarvodaya scheme started in Preindependent India in Bombay. In post independent India The Etawah and Nilokdhari projects were also done as pilot projects.

Any big project needs great effort and very cautious and well thought out procedures. The organizations should have skill to do it, ample finance to do it ,trained personnel to help, and therefore the expansion programme can happen in a phased way only. The need for honest and efficient organization and administration in survival and success of any project cannot be underestimated. What we need is not new policies but good leaders who have the knowledge and the will to serve the nation selflessly. There is no dearth of laws .No dearth for policies in Indian constitution .The revitalization should start at the base of the pyramid ,in each village by local leaders with sincere leaders at the apex who know the needs as well as the regional peculiarities of land and its produce and the variability of climatic conditions and the compassionate heart to rise up to occasions of natural calamities.

Rural poverty alleviation programmes

4th plan (1969-1974) was a growth oriented approach to poverty alleviation and included direct programmes to benefit poverty groups and backward regions like programmes for rural employment ,development of dry farming areas, and for the benefit of small farmer ,marginal farmers and agricultural labourers.The major programmes were drought prone areas programme(DPAP),employment programmes dating from the early sixties such as rural manpower programme(RMP),small marginal agricultural labour (SMAL)programme,crash scheme for rural employment (CSRE),pilot intensive rural employment programme(PIREP).

The preparatory step for the 5th plan call for” direct attack on unemployment ,underemployment, poverty with adequate growth” argued that economy has now reached a stage where large availability of resources makes it possible to launch such a direct attack. The elements of direct attack are-

- 1.generation of employment in rural area through public work programme
- 2.Basic minimum needs to poor such as health ,education, drinking water supply, and housing.

Fifth plan(1974-79) continued the national minimum need programme of clean water,education,rural health, rural roads, rural electrification, housing for landless laborers of villages, environmental improvement in urban slums ,nutrition for pregnant and nursing mothers and pre-school children and school meals for primary school children age group 6-11.6th plan(1980-85) also directed at alleviation of poverty by National rural employment programme (NREP),rural labour employment guarantee programme (RLEGP),a set of programmes with integrated rural development programme(IRDP)at core. 7TH Plan (1985-1990)continues the same scheme and all these programmes have poor households as target groups. With all this what checked the growth with social justice?

- 1.Deceleration of the growth rate
- 2.Widening regional and interclass disparities consequent on green revolution
- 3.Internal dissensions in ruling parties

4. A confidence that higher base development might permit larger resources being devoted to welfare and poverty allocation.

5. Policies of unrelated agencies which began emphasizing basic needs and direct antipoverty programmes in late sixties. (ILO and world bank under Robert McNamara .ILO 1976, Vande Taar 1980, and Agres 1983)

Proportion of people below poverty line fluctuated. 1957-58 it was 50% and early 60's it was 40%, 66-67 about 57% (with droughts) and 73-74 46%. In Punjab and Haryana it was low between 20-30 % and in Bihar, Orissa, West Bengal high 55 % and more.

Rural poverty is inversely related to agricultural performance (pp 21 India's development experience. Oxford India paperbacks 2002 selected writings of S. Guhan). In 1957-58 there were 170 million poor and 1983-84 there were 200 million. 70 % poor were in rural area. The urban poverty is a spill over of rural distress via migration. The core and bulk poverty problem was rural. The poor were characterized by large households, greater proportion of children aged less than 15 and a higher dependence ratio. There was

vulnerability to seasonal fluctuation of employment and wages. In the midseventies the male had 200 days wage employment and 140 days for female.

Direct programme

Under IRDP 600 households under poverty line selected each year in each of the 5000 development blocks in rural India. that is 3 million households annually, with subsidies, loans which form a variety of income earning assets as irrigation well, milch cattle, plough bullocks like goat, sheep, pig, poultry, cart, facility for self employment in small scale production, services (tailoring) and trade. Subsidy cum loan for small farmers about 25 % operating 2 Ha or less of unirrigated land, 1/3rd for marginal farmer, having 1 Ha or less, agricultural laborer and artisan, 1/2 for schedule caste/tribe household. Pre 1989 measures included OAP or old age pension introduced in 1962 for age 65 and above, extended to physically handicapped above 45 yrs in 1974, and destitute widows above 45 in 1975, and deserted widows of age limit 35 in 1986.

Social expenditure in union budget 1991-1996

1. Rural economic and social infrastructure under Jawahar Rozgar yojna 1st stream. MP local area development scheme

2. Backward area development. Under JRY 2nd stream, EAS, DPAP, DDP, Wasteland development.

3. Basic needs. Electricity, adult education, rural water supply and sanitation, urban water supply and sanitation, child welfare

4. welfare of SC/ST & OBC. Under JRY 1st stream and direct welfare programmes

5.Asset creation.IRDP,and related NRY ,PMRY .

The state responsibility of social and economic development in agriculture and allied sectors like fishery, animal husbandry, dairy and forests is important.Irrigation,power generation,roads,education,health and water supply urban development ,law and order of the state are also state responsibilities.

Irrigation:- 1.The problems related to use of resources. The choice of cost-effective investments, adequate funding for undivided projects

2.Related to implementation. Technologically sound design, concern for environmental impact, construction quality, timely completion

3.Operation and maintainance.Avoiding waste. Adequate timely equitable supplies to farmers.

4.Efficient and economic utilization of water in the field involving on farm development and management with the participation of the users.

These need greater financial descriptive and administrative competence than the state governments have so far displayed. It also requires greater socio-political commitment to the nation which unfortunately is not seen in our politicians of the present generation. World bank and Indian agriculture: Challenges and opportunities NO 9412 IN April 1991 pp 82 says :” Most of the issues on irrigation sector have political roots. Poor quality control has direct links to corruption. The specialist skills needed for high quality planning design,construction,operation are inhibited by the perpetual merry go round of transfers and new irrigation projects are often chosen for expediting rather than for the returns.

Funding for agriculture was 37 % in 1st plan and 20-25 % in subsequent plans .The scope of private sector encouragement in diary,agribusiness,horticulture seeds research and extension can raise funds for the state. The co-operation of the rich citizens with the state was there in old systems and for this commitment is needed .This commitment is lacking in new system which is oriented to make private wealth .The panjayathi Raj visualized by Gandhi was on decentralization and raising fund from the rich people of the locality to be spent for the local use and upliftment of the entire area. The reform process in the framework of cooperative federation also is based on this principle ,yet it lacks the commitment and value systems envisaged originally. Real local leadership and HRD from each village has to come from the base.

In early 1990's liberalization was attempted for a high growth for decades to come. Co-ordinated fiscal and monetary expansion with sharp depreciation of currency and major ,quick reform of infrastructure policies in the power sector to draw in private investments once the economy restarts and private sectors needs to meet the demand. This direction was opposed by conservative economists who monopolized the policymaking within

government and the RBI. By the end of 199-2000 the limits to active reduction of primary fiscal deficit had been reached. The first challenge was then to grow out of fiscal deficit and pursue higher growth without bringing about more fiscal crisis. The large buffer stocks of food also sought to bolster confidence to increase fiscal expenditure. It is important to recognize that the mountain of food could be turned to infrastructure, alleviating hunger and poverty, if the right structure of administration and governance for an efficient production of food for work programmes could be found. Direct subsidy on power, water, food, fertilizer, fuel was the starting point for this. This is our second challenge. The first is a challenge of economic policy and the second a challenge for both policy and organization at development and governance. The third is a challenge of governance in private investments in manufacture through infrastructure investments. Roads, electricity, telecom, wireless networks, etc. The third challenge of improving governance of economic institution, be it financial sector, industrial development boards or courts dealing with economic issues. The core of the task is better design, writing better contracts, bringing clearer transparent laws, avoidance of internal contradictions in policy and laws. For this each citizen /consumer of state has to be in governance as a participant, evaluator and user and this is the purpose of education. A bold decision making needs knowledge and commitment and this will bring significant change and for this autonomy of action is required. In 1950's Nehru and in 1991-92 Indira Gandhi took bold decisions due to the autonomy they had in a majority congress government. In coalition governments the autonomy is restricted. Politics to become issue based has to be decentralized and based on regional requirements on a national commitment basis. This is not yet achieved. Man Mohan Singh, took bold economic steps due to his economic knowledge and convictions and not by the party autonomy.

Transparency is needed in commercialization and privatization. The cleverer sections inserted by the bureaucracy can also take back that power that is granted in the very same law to the independent regulator. Therefore the problems of governance are severe and not easily solved. The problems of corruption, bribery, of ignorance, regulatory choices, accounting for transparency are there.

To approach by redistribution (of land etc) was the early policy. These had vast leaks and high costs of administration which the center had to bear. IRDP and its various programmes are of this genre. It expanded bureaucracy and dissent from the poor. The productive endowment for the poor can bring about their participation and make them afford the infrastructure. The state administration has important role in this. The programme of Gokulagraama in Gujarat is quoted as a village programme with community participation and empowerment of village panchayaths and Taluka. (India infrastructure report 2002 Governance issues for commercialization. New Delhi OUP 2002)

HRD is aimed at personal initiative, dynamism and leadership of local people. Gyaandhooth project of rural Madhya Pradesh is quoted as an example where the people with the able guidance of the district collector met with the water problems efficiently and economically as well as ecologically. The farmers switched on to water saving. They made intersect oral water transfer possible from water-rich to water-poor. The effective regulation to address the issue of ecological sustainability is also of significant relevance to the urban sector suffering from acute shortage of water. The

solution suggested by Mr. Asokan ,the current president of the kol krishi co-operative society sangha of Punnayurkulam is such a one and needs to be analyzed and implemented in its proper perspective. The urban population in the nearby township of Guruvayur is ever increasing and its demands have to be met with. If 5 % of the water from the fresh water lakes is transferred to the urban storage centers ,during the off-season without agricultural needs ,the water requirement of the urban sector can be met with at least in part apart from the drip irrigation it can give to the dry mundakan at kuttadan paadam .This was a plan which K.G.Karunakaramenon had in mind in early 1950's itself but at that time the engineering section could not do it ,because of lack of powerful machinery .Now that the power is there ,Asokan feels it can be implemented with efficiency .

Where the micro intervention of the state failed:-

The massive redistribution effect of land was in one shot and then the state focused not on land development for agriculture but on the task of industrial development. Both should have progressed hand in hand .The macroprogrammes of productivity-oriented

public investments, especially in irrigation and education,(primary and secondary)and to some extent the HYV of seeds had important effects. The megaprogrammes of operation floods is a persistent problem which has to be met with and this is an expenditure which one cannot neglect. The macro effects of price support for food production and subsidies to have measurable impact one has to deal with the causes of floods and the prevention of damage to crops too and the surplus storage for emergency food requirements during a natural calamity. For this land reforms or major income redistribution is not sufficient in Indian context.

The tragedy of Indian administration as the report 2002 (pp 31)points out is that the civilian and civil servants blame politicians and the politician, blames the civil servant for all failures. The intellectual failure of taking up the joint responsibility is the major misfortune. The vested interests of the people and the politicians and the beaureaucracy are the actual culprits in this. The national interest should come first .The reason for past policy failures and poor implementation of even good policies have the roots in this. The enlightened citizenship as Swami Ranganathananda envisaged is not there for such efficient leadership .The statement that a good policy implements itself ,mean the good policy or the best policy is that which is for the good of every one .Then it would be implemented by its own. For this the policymaker has to be unselfish and motivated by national interests .The debilitating system of such national dharma though it originated during the British period ,is still continued. There is no reason for us to criticize and put the entire responsibility on the British administration. What they did was out of the lack of information about the Indian system and policy decisions were based on British understanding of climate,weather,economy and commerce. But we have a system of values different from it and if we are reluctant to follow them it is simply out of our vested interests and we have our responsibility more than the British in perpetuating what they had started. Take up that responsibility together and think for a better governance and management of our own affairs in our own way will be the best solution and that is

why decentralization of panchayathi Raj is done ,not to just mimic what was done earlier in British times. In democracy we ,people have to make our own future. The governor general at top and people at bottom was changed to people at both bottom and top in democracy and this should never be forgotten.Privatisation and private enterprises should be understood as the privatization of the people of India ,of people belonging to the different Panchayaths and urban centers of India, to Indian citizens to allow the scope for financing the development of the country.

The inland national navigable waterways are three in number in India and one of them is from Kottapuram to Kollam in Kerala connecting Malabar to Travancore-Cochin. Kottappuram is connected by water transport to Ponnani from ancient times itself. Development of this ancient waterway has several advantages and joint ventures with private companies would be ideal. The infrastructure has to be provided by the private companies for which Government is giving income tax exception. Major private and public sector companies which have interest in developing inland water transport is the Hindustan Lever,Indogulf corporation,NTPC,Numaligarh refineries and concor and the projects with them if made has to be analyzed to make it ecology friendly .

Water conservation, infrastructure and its importance in humanities:-

Community has common rights over water resources. Water harvesting, conservation and judicial use is the responsibility of the entire nation. A good integrated water system at village community level which is economically efficient is the solution for drinking water as well as water for irrigation. Systematic development of village level water issues can change the economies of the village communities. The strategy of water harvesting and surface water developments through series of check wires ,earthen dams (anicut) or bunds ,soil conservation through series of gully plugs,aforestation,agroforestry,to meet the requirement of fodder ,fuel and fruit. The concept of water harvesting to the level of township level expansion is a very good system from the national point of view. The water harvesting devices at surface level is in the form of tanks, wells ,Paathi in tiled roof houses to conserve rain water .The roof rain water in concrete houses has to be brought down to sumps or stored in the overhead tanks itself. These were the simple devices used by people. Recharging the ground water table is done by the rain water storages, by the roots of great trees etc.The large freshwater lake of Malabar needs to be protected and its water utilized to the maximum and the possibilities of agricultural production improvement, development of fisheries and waterways etc to be given proper importance by any administrator /political leader if they are really interested in these projects. The national agricultural policy for handling, storage and transportation of food grains and Government has accorded infrastructure status for these and incentives are extended to them as infrastructure facilities. Both the bund and the waterways and canals and freshwater lake development programmes suggested by the Kol krishi sangham president belongs to this and can be placed under the Infrastructure funds of pure project development and the integrated project development and funding .As a joint venture of IIF and integrated project development and funding this can be undertaken .

Public feedback aids public accountability. A sustained and collective co-operative action at village community level increase the public accountability of offices of their representatives. For speedy answers from each area the public voice as well orchestrated and heard by the leader, and the voice of the leader trickling down to the society speedily is a must. For this a report card methodology is adopted or e-governance if there is facility.

The report card survey is simple and highly flexible for organizing public feedback.

The stages in its survey are :-

1. Identify an issue through forums of group discussion
2. Designing the instruments of survey
3. Identify the sample for survey
4. Conduct survey by a independent agency
5. collect qualitative data
6. Place data in the public domain
7. Conducting advocacy and establishing partnerships

Community partnership in India

STATE	CP INDEX (0-3 SCALE)
Kerala	1.80
Maharashtra –measured only in planning And constitution stages	1.80
Rajasthan	1.50
Karnataka	1.45
Gujarat	1.10

In the Gujarat Pani panjayath(village water committee)the implementation agency (State water board)did not co-operate. Therefore poor utilization of the project happened. In Kerala special organization socioeconomic units(SEUS)under KWA(kerala water authority) was to implement the pipe water scheme. It was funded by donor agencies. The SEUS personnel were social scientists in charge of development of local participatory institution. In each village ward water committee(WWC)was responsible for decision of location of water stand posts ,health training, awareness building. The meetings were conducted by villagers themselves .SEUS monitored them gave advice. Both WWC and SEUS acted as liaison agents with KWA.WWC was responsible for reporting faults

,follow up repairs, doing minor repairs through training and paying a local person. Their role was well defined.

The IRDP programme was for generating employment through resource base at household level to remove poverty. Adherence through planned development till early 60's is recorded. 1960-1970 was the most difficult period for development and 260 million people were below poverty line. In 1980 after the massive mandate for congress, in 1983 252 millions of rural people were poor and poverty ratio decreased to 46 %. 1987-88 the decrease was to 39 % and 1993-94 to 37 %. But the Lorenze ratio, the measure of inequality for rural India remained stable. The 9th plan (1997-2002) questioned this stability. In 1973-4 to 1993-94 the total rural/urban poor was 320 million. 1999-2000 survey, of world bank data showed 360 million poor which is 40% of the world's poor population.

1973-2000 poverty and inequality in India

Year	Poverty ratio	No: of poor rural in millions	Poverty gap	Lorenz ratio index	No; of rural urban poor in millions
1973-74	56.4	261.3	16.56	0.27581	321.3
1977-78	53.1	264.3	15.73	0.33861	328.9
1983	45.7	252.0	12.32	0.29759	322.9
1987-88	39.1	231.9	9.11	0.29826	307.1
1993-94	37.3	244.0	8.45	0.28190	320.3
1999-2000	27.1(based on 30 day recall)				
	24.0(7 day recall)				

Drinking water facility in Indian villages (pp 192 India infrastructure report 2002)

Sources	Villages %
Well	69.8
Hand pump	55.9
Tube well	21.1
Tap	18.2
Tank	14.3
River	10.0
Nala	3.6
Canal	3.5
Fountains	2.6
Spring	1.7
lakes	0.1
Others	4.5

In Kerala the wells and tanks and lakes are important since there is enough rain water. The cost of one hand pump is Rs 20000 and the pipe is user oriented and well water is safe and cost-effective according to the report. The lake resources wherever available has to be protected since the lakes –both natural and manmade is essential for ecology and ground water reserves. Both irrigation and drinking water has to be considered with equal importance. The available freshwater supplies to be made use of maximally .So that the responsible water use is made to prevent degradation of this important resource for life on earth.

The weather makers and global warming

“The spotlight thus falls on political elites, administrative mandarins, and scientific advisors. Here is their genuine opportunity ,not just to act with political maturity but to take a giant leap on behalf of humanity. Can they break with all the vested interests ,the inertial forces, the conventional wisdoms, which are the historical lot of those in power ,even while these have now lost all value ? Through some Damascene vision might they at this late hour provide not only redemption for themselves ,but for the rest of humanity too ? One thing ,though, is sure: Little time is left.” (Mark Levine and David Cromwell June 2007 .Preface Surviving climate change .The struggle to avert global catastrophe. Pluto press 2007)

The major trends that are shaping our future are recognized as the food trends, the energy and climate trends, economic trends ,transportation trends, health and social trends and conflict and peace trends. The year 2004 was a record breaker of expansion of world economy at a 5 % rate and consumption and production of everything from grain to meat and steel and oil rose to heights. The sudden shift was summed up by the achievement of China in steel production. The global grain harvest shot up by 8 % and rises in consumption and change in diet pattern occurred. By this the grain reserves became very low at the end of the year leaving the year vulnerable to a food shortage and high prices if the 2005 harvests were hurt by adverse weather. Total carbon emissions and atmospheric carbon dioxide accelerated and 2004 was the fourth warmest year ever recorded and the 10 warmest years in last 120 years were after 1990.Rise in temperature melted the polar icecaps, and glaciers .Thinning the ice of arctic is happening and by 2100 the arctic ocean is predicted to be ice-free. The collapse of the ice sheets of Greenland and Antarctica causes a rise in sea level. The worlds ecological system is in danger as human forces are impinging on coral reefs ,tropical forests and other critical natural systems.1/4th of

mammals and ½ of the world's wetlands are already lost to us. By the 2004 December Tsunami, the importance of the preservation of wetlands and the coral reefs which are key ecosystems of the globe were recognized. The severe damage to wetlands in the name of development and also of coral reefs are pointed out as reasons for the calamity. Grain harvest in 2004 was 2049 tons as against 800 tons in 1960. After the declining Harvests of the five years (in previous 7 yrs) wheat was 11.5% more than the 2003 harvest. United Nations declared the year as international year of the rice. The rice demand always outpaces its production and it is this one crop which actually gives awareness about a pending food crisis. Rice is 20% of the world's energy supply in calories directly. Wheat is 19% and corn 5%. Since demand exceeded production since four consecutive years China, India and Pakistan (major rice growers) pushed prices higher. Global rice stocks dropped. People are hungry not because of global shortage as such but by the lack of regional sustenance farming and lack of purchasing power when prices go high. Hunger kills more than 5 million children each year, roughly one child every second (pp 22 Vital signs 2005-2006 world watch institute)

Energy and climate trends:-

- 1 Fossil fuel use surges
2. Nuclear power rises once more
3. Global wind growth continues
4. solar energy markets booming
5. biofuel use growing rapidly
- 6 climate change indicators are on the rise. Like CO₂, heat, glacier melting etc.

Economic trends :-

Global economy continue to grow

World trade rises sharply

Foreign direct investments inflow decline

Weather-related disasters near a record

Steel surging

The inflows of foreign direct investment from 1970-2004 show that there is a general

decline of investment from industrial countries. Is the industrialization a failure ?Or is it that they are not investing globally?

The foreign direct investment from 1970-2004 (10 yr interval) billion 2003 dollars from UNCTAD

Year	Total	Industrial countries	Low/middle income countries
1970	50	37	14
1980	108	91	17
1990	271	222	49
2000	1471	1174	297
2004	601	315	286

Weather related disasters on record in 2004:-

105 billion pound economic loss due to natural disasters.Storms,tornados,floods,heat waves, extreme cold waves.12000 people lost lives. December 2004 earthquake in Sumatra and subsequent tsunami in Indian ocean swepted away 280000 people in 11

countries in a matter of few hours and millions left homeless. In summer monsoons of 2004, 2200 people were killed in India, Nepal and Bengladesh.Dakka was submerged under water for 40 %.China and Caribbean lost 2000 lives in summer floods. In Yangtze basin 85 % of forest cover was clearcut,14 million people displaced in floods and 4.5 million Ha of cropland destroyed. Rain surged down barren slopes of Haiti and local forests stripped for fuelwood.From 198 onwards 110 -205 events of severe floods occurred the world over.Deforestation,erosion,irrigation interfering river drainage ,global climatic changes and filling of wetlands and fields for construction works etc have all contributed to this. Southern US and Caribbean was hit by a string of hurricanes in 2004 Charlie alone causing 20 million dollar loss. cyclones in Japan, landslides environmental disasters were on the record in 2004.The economic loss in 2004 was 104.6 billion 2003 dollars which had a similar figure in 1998 (106.7).

Health and social trends:

Population continue to rise steadily

Number of refugees decline

HIV/AIDS crisis widening worldwide

Cigarette production dropped

Conflict and peace trends:-

Violent conflicts unchanged

Military expenditure surges

Peacekeeping expenditures soar high

Mixed progress on reducing nuclear arsenals

SPECIAL ENVIRONMENT FEATURES

1 Mammals on decline

2.Global ice melting increases

3.Wetlands dry up

4.Forest loss continues

5.Air pollution still big problem

MDG(Millennium development goals) are :-

1.Eradicate poverty and hunger

2.Achieve universal primary education

3.Promote gender equality and empower women

4.Reduce child mortality

5.Improve maternal health

6.combat HIV/AIDS ,malaria and other diseases

7.Ensure environmental sustainability

8.Develop a global partnership for development

In 1903,Sir Edgar Wallace called the atmosphere the great aerial ocean. It protects all life, connects everything with everything else and has regulated our temperature for 4 billion years. The weather is what we experience every day. Climate is the sum of all the weathers over a certain period for a region or for the planet as a whole. The troposphere of the earth which is 10 Km in height ,slightly above the Mt Everest, has only a little part (bottom one third)of breathable air. Beyond that the strato,meso and thermosphere has no breathable air.The keeling curve of CO₂ concentration in ppm atop Mt Launa loa,Hawai between 1958 -2000 showed a change from slightly less than 315 to over 370 .All these carbon when it goes from atmosphere reaches carbon sinks ,including you and me, all living things and ocean,soil,even rocks. That is the earth .The orbit of earth at present is not very elliptical and there is only 6 % difference between January and July temperatures. In one lakh years there is an orbital cycle of earth which changes the intensity of sunrays reaching earth. Another cycle due to tilt on earths axis lasts 42000 years and a third shortest cycle changes in 22000-25000 years due to wobble of earth on its axis. In this ,the earths axis shifts from pole star to Vega affecting intensity of seasons. When Vega (Dhanishtaadi) marks true north winters will be terribly cold and summers scorching hot. This was known through Milanchovich , to western world only in 1941 .(This was so when Paithamaha wrote Vedangajyothisha in India)With sunspot cycles of 11 years the earth temperature vary. More the sunspots more is the warming of earth. But it does not affect the life on earth in dangerous proportions. The present

stratospheric cooling by ozone hole and tropospheric warming by increased greenhouse gases is mainly manmade disasters due to industrial revolution. Today we face a rate of change thirty times faster because the living things need time to adjust. Speed is important as scale when it comes to climate change. For more than 10000 years human Indian and Mayan calendars which swepted of the great urban beings have been deforesting earth. And a great flood in BC 3104 is recorded both in port city in the Rann of cutch,Dwaraka .And the new cities developed in 3100 in Mesopotamia ,on its southern end.

Now carbon,oil,solar energy are used indiscriminately and disproportionately which had lead to the speeding up of the climate change and nine out of ten warmest years ever recorded occurred since 1990.(pp70.we are the weather makers .The story of global warming. Tim Flannery Penguin books 2006).

The rise in temperature had started in 1970 itself.1976 and 1998 had two rapid rises. The 1976 one occurred when scientists drilled the oldest coral porites in Mainana in pacific nation of Kiribati.A shift in jet stream, changes as far as southern Australia and Galapagos in pacific ocean on equator 1000 kms off south American coast recorded by national geographic. In 1830 Darwin visited here. In 1977 the native finch perished in

draughts only 180 survived of the 1300.Of them 150 were males and tough competition for mates in the spring and only the big beaked variety survived.1998 is tied up with El Nino –La Nina cycle ,a 2-8 year long one which brings climatic changes.

El Niño means the new child, Christ coined by Peruvian fisher folk who noticed warm currents during Christmas visiting the fishing grounds.La Nina is the new girl child that is the cooling period in ocean of south America. La Nina phase has winds blowing westward across pacific pushing warm surface water to coast of Australia and to its north. Then the cold Humboldt current is able to surface off pacific coast of south

America carrying the nutrients that feed the prolific fishery in the world, the anchovetta. El nino phase begin with weakening of tropical winds allowing warm surface water to flow back eastwards overwhelming the Humboldt and releasing humidity to atmosphere which brings floods to the normally arid Peruvian deserts. Droughts strike Australia and south east Asia.El nino when severe devastate 2/3 rd of globe with droughts ,floods and extreme weather.1997-98 was a severe El nino year. As greenhouse gases build up in atmosphere we will experience persistent El nino like conditions. It is the bird watchers, nature and animal watchers who have recorded the climate changes first. In India it has a very long history. In England the first record is between 1736-1947 when a family recorded the date the first frog and toad croaked on their estate every year .In 1850 no such records are there. Over the last 55 years over the globe the records are strong .The species are shifting to the pole by an average of 6 KM per decade and retreated up mountainsides at rate of 6.1 meter per decade .Spring activity has advanced 2.3 days per decade. These trends accord with scale and direction of temperature increase by greenhouse gas and is called global fingerprint of climate change.CO2 is driving nature Polewards with a lash. Tiny marine organisms called copepods,nonmigratory species of 35 varieties of butterflies have changed habitat. The butterflies have perished in the

south. The tropical birds of costa rica low lands in last 20 years moved 18.9KM northwards. Northern hemisphere seabird lay eggs on average 24 days earlier each decade .Budding and flowering of plants is 1.4 -3.1 earlier per decade and this denotes change inspring activity. Spring is warmer than it was 25 years ago. But number of cold days in winter is unchanged. The winter moths therefore hatch upto 3 weeks before the oak bear their first leaves, and the caterpillars can survive only 2-3 days without food, and perish. Those that survive grow fast since no competition for food meaning birds have less time to find them .Even the remotest rainforests face the threats of global warming.The sub Atlantic plankton pool is the base of foodchain.They thrive even in winter under the ice and the krill feed on them and complete their 7 year lifecycle. When there is krill there is penguin. Since 1976 the krills decreased 40 % per decade. Emperor penguin is half of what it was 30 years ago.Adelie penguin has declined by 70 % .Antarctic is frozen continent surrounded by immensely rich ocean. Arctic is frozen ocean surrounded by land. And is home of 4 million people. In Alaska the winters are 2 -3 degree C warmer than 30 yrs ago. The thundra,the collared lemming, the reindeer ,polar bears ,nanuk,ivory gull of Canada all face threat of racial extinction by about 2050.And north polar cryosphere will vanish forever with unknown consequences of climatic changes, all due to manmade greenhouse effect.

We Indians must know something about the protection of ocean and the coral reefs in it too. Coral reefs yield 30 billion US dollars each year to people who have no other resources to live. The citizens of five nations are protected by the fringing coral atolls which stand between them and the invading seas. Destroying the fringing reefs ,you

destroy all the pacific nations just like bulldozing Holland's dykes.The biodiversity of the corals also is destroyed by that action. Corals are marine equivalents of south Africa's sand plains with great biodiversity. In 1857 Alfred Russell Wallace described coral gardens,medusae,fishes and many other in Ambon Harbour and in 1990 none of them exists. Just effluent ,garbage, butchered remains of animals and goats are described by Tim Flannery.In 1997-98 El Niño, rain forests of Indonesia burned like never before.

Before that south western Sumatra had rich biodiversity of coral reefs.1997 saw red tide in Sumatra coast due to minute organisms fed on iron in the smog of the fire. The smog cloud over south east Asia in 2002 El nino was larger. About the size of US. It cut 10 % sunlight heated lower atmosphere and ocean.Aquaculture and corals alike are devastated from Indonesia to south Korea .Recovery is unlikely for these east Asian coral reefs.2004 ,scientists visiting Myrmidon reefs off coast of Queensland for the 3 yr survey reported they looked as if bombed. The reef crest was bleached leaving a forest of dead white coral. only on deeper slopes did life survive. Before 1930 coral bleaching due to high ocean temperature was not heard of. In 1970 it was small scale. In 1998 El nino it was global dying. The great barrier reef was bleached 42 % in 1998 and 18 % suffered permanent damage.2002 El nino killed 90 % of all reforming corals ,60 % of great barrier reef was affected .In 2006 cyclone Larry came which destroyed 50000 homes in Queensland and secured the reef for another year by its cooling effect on ocean water.

The golden frog of central American rain forests in costa rica is an example of loss of

species quoted. In April May alone the males surface and mate with the females. The last male appeared in May 15th 1989 and no more of the race now exists. He was the first victim of global warming recorded. We killed it with our reckless use of coal fired electricity ,huge cars and causing global warming .

The gastric brooding frog of SE Queensland disappeared within 6 years after its discovery in 1973 by researchers who wanted to know how the female frog converted the stomach into a nursery and delivered children through mouth. Amphibians face threat of extinction by climate as well as by experimental science.

1960 the Sahel disaster of Africa:-This was a marginal rainfall area and regional more rain and better soil allowing a living through fields and in dry lands a semi nomadic camel herding life. The famines and droughts were common. And for decades the west argued that the reason is the people themselves who overgraze the camels, goats and cattle, gather firewood, destroy the covering vegetation, expose its dark soil and change its albedo and so on. But all these were proven wrong by painstaking studies in US between 1930-2000. The human –caused degradation was too small to trigger the climatic shift. The rise in sea-surface temperatures of Indian ocean increasing greenhouse gases was the real reason. The Indian ocean is the most rapidly warming ocean in the world and as it warms the conditions that generate the sahelian monsoon weaken. The rainfall is less. Food is less. People starved. From arid Africa (which generates ½ of global dust) particles scatter, absorb light, lower temperature ,carry nutrients to ocean and distant lands assisting in growth of plants, planktons and increase absorption of CO₂.

In SW corner of west Australia rain fell during winter and get 100 cm annually. The farming is done here. The wheat belt is here. vineyards also have come up. Before the European settlements the southwest was blanketed in thick vegetation called Kwongan(as konkan in India).Following rains the kwonkan become a vast wildflower garden and several species are jammed in a single hectare.1829-1975,the first 149 years of European settlement people cleared kwonkan for farmlands. From 1976 there is decrease in rainfall and problems for agricultural economy. In 1960 the farmers with goal of clearing million acres of kwongan scrub per year bulldozed and found only sterile stretches of sand and the most unfertile soil underneath the natural vegetatin.The farmers did hydroponic gardening .Drilled in their wheat, dusted the sterile sand with nutrients waited for the never failing winter rains to come and water their seeds. By 2004 ,decades after nature refusing to water, wheat growing shifted westwards replacing dairy farms

Winter rainfall has decreased and summer rainfall increased. Before the bulldozing the vegetation was taking up salt brought by westerlies and every drop from heavens and salt stayed in xalline form by them. But now ,when summer rains fell the salt from sea creep up kill everything .The first sign is salty taste impervious sweet creeks. The water became undrinkable. Streamside vegetation died converting within a decade into salty drains. The perished farmers faced worst case of dry-land salinity .Neither science nor Government has given any solutions and damage bill is in billions (pp 117 Tim Flannery)Perth is now a thirsty city with 1.5 million people ,bankrupt wheat farmers trying to sell their fields .Less winter rainfalls causes less water in Perth's catchments Since 1975 rain falls in light

showers that soak into the soil and do not reach the dams at all. Now the Government is planning to squeeze out groundwater from Ghangara mound destroying its biodiversity also ,and to lay a desalination plant at cost of Australian dollar 350 million to suck ocean water and remove saline from it. All the cities in Australia are facing water crisis of some sort. The west coast of America also has water problems.

Most powerful El nino of 1997-98 the most powerful fatal hurricane in 200 years ,the hottest and deadliest European summer on record(2003) the first south Atlantic hurricane ever*(2002)unprecedented flooding in Mumbai (2005)worst storm season in US ,most economically devastating hurricane Katrina (2005)and Monica ,the most powerful cyclone ever recorded in Australia(2006) and Tsunami(2004) are eye-openers for us. Warm water warm air and it carry extra heat .30 degree C air hold four times as much hurricane fuel as air at 10 degree C.Since 1950's the hurricanes have changed their tracks. The example is the frequency of typhoons ravaging East China and Philippines sea has decreased since 1976 but number increased in south China sea.

In Arabian sea and Bay of Bengal there were fewer typhoons which is good for millions living near sea level in these regins.Dramatic decrease in number of cyclones in subantartic ocean south of latitude 40 but a modest increase in Antarctic ocean is seen.1996.97.98 consecutively US had hurricanes. In 1780 there was a great hurricane which was severe. In 2004 storms returned .4 major tropical storms crossed Florida in quick succession.

Katrina-Florida,Gulf of Mexico, New Orleans,Rita-Texas

Started as thunderstorms in warm waters off Bahamas, became tropical storm ,a group of thunderstorms that circled until it developed a vortex. In UK the recording of climate as records started in 1660, about 60 years after they had contact with Indian subcontinent and its trade and commerce based on sea routes and crop systems.1990's was the warmest decade after that records began. The two nations most disadvantaged by climate change are US and Australia.

In India, apart from Gujarat and Western Orissa there is less drought than 25 years ago. Only NW India experiences heatwaves.2005 saw record monsoon rains and storms in Mumbai and surrounding regions which brought devastating floods and damaged offshore Mumbai high gas field.

Rising sea level.

2/3 people on earth live within 80 KMs of the coast. Even a modest rise of sea level would be disastrous from Manhattan to Bay of Bengal. The Asian tsunami of 2004 gives n indication of this. Netherlands is planning construction of superdykes ,Thames barrier is being strengthened for prevention of further damages by such catastrophe. In Bangladesh 1 million live within one meter of sealevel.(An island over which west Bengal and Bangladesh were having problems of ownership has actually disappeared this

year). Thermal expansion of ocean, glacier ice melting lead to rise in sea levels. Climatology is a science of prediction. From 2003 the Hadley center for climate prediction is set up in England. Half of the energy generated after the world war 2 till date since Industrial revolution has been consumed in last 20 years by human activity. And it is too late to alter this situation in our world. But we have time still to avoid disaster and reduce probability of dangerous climatic upheavals and its effects.

We can limit the carbon dioxide emission. protect nature, trees, biodiversity, water resources, fields and forests with wild life and resort to more simpler and traditional lifestyles to reduce consumption of energy. This is what Gandhiji was advocating all along as a visionary.

Methane release from seashore Ice crystals trap molecules of methane. Clathrates (Latin-caged) is the name for this ice which burns and contain gas under high pressure. When brought to surface these burn ignited. There is massive deposits of this in the seabed. 368 trillion cubic meters of natural gas is recoverable in the world. The ocean floor has 10000-42000 trillion cubic meters compared to this energy. If this is touched and released colossal bursts of methane energy will happen. The entire planet will be destroyed and all species extinct. That will be the end of civilization. Australia, the most urbanized nation on earth is having climate variations due to high energy consumption of its cities. The people all over and scientists all over warn about these consequences yet our local administrators are ready to explore ocean floor, drill it for treasures, bulldozer it for destroying old sethuses under it or for getting oil and gas below it (as in Kochin). The methane energy of the caged pressurized variant is lurking below to devour everything in

a catastrophic final deluge and man is foolish and selfish not to see this danger even after predictions by climatic experts.

Ozone is the earth's sunscreen shielding us from 95 % of UV radiations. In 1928 industrial chemists invented HFCs for refrigeration, propellants in spray cans, in air conditioning units. 1985 the use of it was 1.8 million tons. They increased chlorine levels five times the previous levels. The hole it punched in ozone layer south of 40 degree latitude exposed to them to skin cancer (southern Chile, Argentina, Tasmania, south island of New Zealand) Even near the equator the chances of skin cancer increased. 25 years ago chance of getting melanoma was 1/250. Today it is 1/84 due to ozone depletion. Immune system and eyes are damaged by UV rays. Early cataract can occur

1987 Montreal protocol addressed the global pollution problem successfully. In 1997 the Kyoto protocol aimed at reduction of CO₂ emission by 5 %. But four nations failed to ratify it, including USA and Australia. Because supplying energy was profitable. Emissions trading creates a new currency called carbon dollar. Australia had the highest per capita greenhouse emission of any industrialized country, 25 % higher than USA. At present the Kyoto protocol is the only international treaty to combat climate change. Can we find solutions to problem of global warming while continuing to use fossil fuels? Carbon is locked in coal for hundreds and millions of years and will remain there for more millions more if we refuse to dig it up, just for the sake of profits.

How to solve ?

Wind power and turbines is used by Denmark .In China wind farms contribute to global electricity grid.3000 megawatt of wind power is enough to power a small city. Solar hot water, thermal and photovoltaic cells is another alternative suggested. The average home requires only 1.4 kilowatts of power to run a photovoltaic cell .It operates best in summer and one need generate only what one needs. Japan is using this. Sun is a nuclear power at a distance. Earth based nuclear power is an alternative choice .From 2004 May the world is considering this .It does not emit carbon dioxide. India has reactors under construction . China also is seriously considering this option. Geothermal reservoirs of molten mantle of earth is suggested by some. The decarbonizing the grid is decentralizing power and empowering individuals.

We need not wait for the govt but can start doing it at home.

Use solar energy.

Buy a hybrid fuel car.

Select a aircraft that fly lower so that co2 consumption is less (4%) and average flight time over Europe vary less than a minute.

If we can cut our personal emission by 70 % ,the schools,companies,farms etc can also do that at a higher level

Start a movement in the locality

Use handmade /herbal/natural things

Use organic manure and protect the livestock

And many others depending upon the region located.

Use biofuel for energy needs .Biofuels are derived from biomass ,that is living organisms, and metabolic products. Like hay,corn,plant leaves,grass,dung and urine of animals etc.They are better than fossil fuels(coal,oil,gas) because burning biofuel does not increase the carbon dioxide in atmosphere. The slash-burn agriculture and the bioproducts of domestic animals for energy was thus a very scientific protective method which Indians used for millennia. Liquid biofuel is the ethanol. Level of carbon dioxide have increased from 280 to 385 ppmv since 1750,which is 37 % and this is due to burning of fossil fuels and still people are drilling oceans to get fossil fuel .While I write this Arabian sea is being drilled for it at Cochin and no one thinks that we are digging our own grave in two ways by disturbing the depths of that ocean .Most of Kerala's

coastlands are below sea level and at or slightly above sea level.

Another thing we can do is protect our tree and grow more forests and trees .

My health village scheme (Music therapy in education, management and administration Roadworthy publications 2008) is intended for the beginning of it at a local level.

Planting nutritious fruit trees of the local varieties in each home and school and roadside and helping forestation and protection of biodiversity by social co-operation etc are possible by us without any Government help. Only when it is a policy decision we need approach a politician/Government agency for help. Self help is the best help.

In 100 ways to change the world Johan Tell says call the politician as first and last (1 and 100).The reason is ,we have no power to make policies and we can say that such and such are the problems and such and such policies would help the nation. If he is committed and if what you point out is for the benefit of all your ideas may be put into policy decisions and you can help the world. That is the first .If even after several calls and requests for help ,he doesn't heed ,the 100th (the last)call is to tell him that we are withdrawing our support and vote for you and that will do the trick.(100 ways to save the world. Johan Tell. Bonnier books 2007)

The deforestation had been due to the following reasons in Europe.

1.cattle ranching because of Europe's appetite for processed meat.

2.Activity of farmers encouraged by state to settle in forestlands and the slash and burn agriculture.

3.fires,mining,road and railway construction

4.logging ,legal and illegal

5.large scale commercial agriculture as livestock food sources and estates etc which are monocultures and the biodiverse forests are destroyed for this economic activity which is short-lived.

About 117000 sq KM of rainforest is destroyed each year and rainforest cover on globe is now only 5 % and the carbon dioxide level is more because of this.

The CO₂ and greenhouse gas emissions of each country is assessed.USA is the first and the worst polluter .Second is China and third is EU.The order is as follows with India in

5th place.

USA

Agroeconomy and Agricultural History of India

China

EU

Russia

India

Japan

Germany

Brazil

Canada

Uk

Greenhouse gas emission including land use change is as follows:

USA

EU

China

Indonesia

Brazil

Russian federation

India

Japan

Germany

Malayasia

(UK is 13th)

So all of share the responsibility for killing our own earth and our own life on it. The warming of climate ,the global rise in sea level and co2 increase etc are more after 1950 and scientists have found that man and his greed alone is responsible for this.

Sealevel rising

IPCC third assessment report predicted that by 2100 the rise will be by 9-28 cms .NASA reports a sea level rise on average 3 mm every year between 1993 and 2005. That is 3.6 cms over 12 years. In 1961-2003 over 43 yrs the rise was only 7.46 cms .Oceans rise when there is thermal expansion. Warm water takes more space. second reason is melting of ice and glacier by global warming. The third cause is reduction in salinity as more freshwater added by melting ice. Freshwater is less dense and takes more space than salinewater. Apart from the entire coast of kerala the other major cities endangered by rising sea level Are

Tokyo

Shanghai

Hongkong

Mumbai

Calcutta

Buenos Aires

St Petersburg

New York

Miami

London

Many small islands in Indian and Pacific ocean ,like the Maldives, Carteret island in Pacific (which will be the first to be lost)By 2015 this island with its 2500 inhabitants will be lost forever is the prediction(pp96 The A-Z of global warming Simon J Rosser .Schmaall world publishing 1988).

How do you think the Indian astronomers knew the cyclical nature of climate and the great world cycles of yuga ,kalpa etc? Simply by experience and observation and deduction they have known the eccentricity of earths orbit around sun and the perihelion at Makaram 1st and aphelion on Karkitakam 1st. (Now the West place it on 3rd January and 4th July based on the region of Greenwich)The earth is close to sun in summer of southern hemisphere and winter in northern hemisphere. It is farthest from sun when the northern hemisphere has its summer and southern has its winter. The tilt of earths axis between 22.1 to 24.5 degree (currently 23.5) on its orbital plane cause cycle of 40000 years .Now the tilt is becoming more upright from 23.5 to 22.1 and there is a climate change. The tilt causes the seasons tilt greater, severe warmer summer and cooler winters.

Less tilt, cooler summer and milder winter When cooler summers happen ice mass formed. Ice has reflective surface and reflects sun's energy back to space keeping temperatures in poles cool. If the Greenland ice melts completely the sea level will raise by 4.5 to 6 meters .Precession of equinox is the earth's wobble around its axis and has a cycle of 26000 yrs.The perihelion and aphelion then changes completely. Now the southern hemisphere is tilted towards sun at its perihelion (Makaram or Utharaayana)but by 26000 years this will reverse. This is called ayanaamsa by Indian astronomers and precession of equinox by the west.

The ocean thermo haline circulation(OTH) is the ocean conveyor belt ,meridional overturning circulation(MOC) and these are terms used for a system of large currents that bring warmer water from equator to northern hemisphere and returns colder water back to equator. It depends both on temperature and the salt and hence the name. London is 51 30 degree north of equator as Saskatoon in Canada. Saskatoon is covered by ice about 5 months of year during winter. Glasgow and Hudson bay in Canada are in same latitude, and the moderate climate of Europe is maintained by the warm drifts from equator. The transport of ocean nutrients for marine life also is due to OTH.OTH drives the north Atlantic drift while winds drive the gulf stream .(That is why people around the equator knew the monsoon and the ocean currents and the west did not know it)..The currents are affected by the global warming as it has slowed by 30 % though it is within natural variability of changes.

Earth's population growth

Current 6,500,000,000

20 yrs ago 4,000,000,000

BY 2050 expected 9,000,000,000

This contribute to global warming, energy needs, food consumption, more of fossil fuel pollution, a vicious cycle .Water, food and climate ,will be problems for the entire life on earth.

Billions of people in 1830 was 1.

1930. 2

1960 it was 3,

1975 became 4.

1987 5

2007 6.5

By 2050 expected 9.(credit population institute figures)

Unless we use renewable energy to substitute the fossil fuel we may not be able to break the vicious circle,

The renewable energy is that can be regenerated

1.solar power(Akkaasa)

2.wind power(Vaayu)

3.hydropower(aapas) which includes hydroelectric, tidal and wave powers

4.geothermal(agni) from heat of earth.

5.biomass (prithwi)

These are the five elemental powers which can be regenerated by recycling. Nuclear power does not produce greenhouse gases .Therefore some nations are thinking about it as alternative.

The ancient astronomers of India were aware of a 11 yr cycle of sun and an increased

magnetic and sunspot activity called the ucha or maximum of the sun and then a manda or minimum period of quiescence. With sunspots the sun activity is maximum .The last solar maximum was in 2000-2002.Heliopause is an ultrasound technique for the sun's body. The NASA with it predicted the suns next solar cycle to begin in 2007 -2008 and 30-50 % increase than the current cycle with a peak in 2012 (cycle 24).The solar radiation is not the reason for global warming but anthropogenic forces(manmade)are the cause has been proved. Temperatures of last 1000 years remaining constant and from 1800 a sharp upward rise is the evidence for it. The 1990's were the warmest decade and 1998 the warmest year. For last 150 years man has created this problem.

2005 and 2007 were hottest like 1998,and even more and 2002.2003,2006 were very hot. Global warming increases mosquitoes, pathogens like malaria and mosquitoes can survive in a wide area and higher altitudes with warm temperatures. A population of 40-60000000 in Africa will be prone to vector-transmitted malaria with a temperature rise of 2 centigrade.

Weather changes like heatwaves,floods,droughts and hurricanes are due to global warming. In 2003 before tsunami Europe had heat wave that killed 35000 people.15000 were in Paris alone. August 2007 terrible fires raged Greece. June 2007 floods and rains in north of England happened .Danube, Rhine and Rhone overflowed. Increased rain in

northern hemisphere and reduced rain in the tropics and subtropics happened.

Droughts in Australia,USA,(California)and Mississippi are having effects of Drought . May 2007 saw drought in Australia .Queensland and Sydney are under threat. A tropical cyclone is a low pressure system that has a cyclonic surface wind circulation. If it occurs in North Atlantic and Northeast Pacific ocean it is called a hurricane. In Northwest Pacific, to the east of 160 degree longitude it is called a typhoon. It is called a cyclone in Southwest Pacific ocean and North and Southwest Indian ocean. Data from 1851 is available and from 1944 are with aircraft monitoring and from 1970 it is with satellites. There were five or more hurricanes over four years in 1950s ,three different years in 1960s,and 1990s and over two years till 2000,but 2004 saw six major hurricanes and 2005 saw seven.2006 was quieter with two major hurricanes.2007 had 13-16 named storms,7-9 hurricanes ,3-5 major hurricanes.

The most active was 2005.28 named storms ,15 were hurricanes,7 of them major. This beat record of 1969 with 12 hurricanes ,5 of which were major. In 1950 eleven hurricanes ,eight of which were major.50s 60s and 90s were active hurricane periods.1995-1999 a record thirty-three hurricanes recorded.1991-1994 was the quietest after the 1940s .Atlantic hurricanes alternates between quiet and active period of activity over 20-25 yr periods. Typhoons increased since 1980s after a decrease in activity from 1960-80.The activity cycle is thus similar to Atlantic hurricanes. When there is ocean warming hurricanes become stronger. The destructive power of hurricanes has increased since mid 1970s when there was rapid increase in the global ocean and land temperatures. Just after the tsunami of 2004 there had been a record year of hurricanes in North Atlantic with 27

named storms ,7 major, and four reaching category five status.

Category 5 storms of 2005:-

Emily hit Mexico in 18th July 2005

Katrina developed in August and made landfall in Louisiana and Mississippi ,of category 3 strength

Rita developed in September 2005 ,close to Florida on 20th,causing storm-force winds upto 76 mph on Key west. It strengthened and tracked to Mexico and reached category status with 175 mph

Wilma arrived in October and produced 60 inches rain passing over Yucatan peninsula in Mexico and made landfall in Florida as category 3 storm

In 2007 the hurricane Dean damaged Jamaica as it made its way to Mexico.

We have altered the weather and water cycles and caused the extinction of biodiversity on face of earth and are heading for our own extinction by own deeds.

Animals under threat are the polar bear, sea turtles, whales, giant panda, orang-utan, elephant, tigers, birds of different varieties, pikas a small hamster sized flower gathering mammal in Alpines of western USA, SW Canada and Asia. varieties of frogs including the golden frog of Costa Rica, penguins, coral reefs with several symbiotic organisms depending upon them. We will soon have the same fate as these forms of life.

What we can do?

1. turn off all electrical appliances when they are not in use-the phone chargers, TV, DVD, which take 10 -60% of normal power even when in standby. Make sure that the plugs are easily accessible to turn off easily.
2. Standby buster and energy tracker. Turn off the appliance with remote handset. The equipment functions via radio waves and have a playback time of 6 months. It measures your energy consumption and allow you to monitor the power consumption.
3. Buy energy –efficient appliances Don't keep the fridge near a cooker so that it takes more energy to keep cool.
4. Turn off lights when it is not needed.
5. Boil water that is just enough for use.
6. Turn down household thermostat down 1 degree centigrade to reduce carbon blueprint and to save money
7. Use solar energy whenever possible
8. Insulate properly to prevent heat loss
9. Take a shower. It uses less energy than a bath in bathtub
10. Recycle rubbish to reduce energy requirements. Like the wastes, paper, cardboard, tin, aluminium cans, glass bottles and jars and plastic cans. UK is doing this (www.recyclenow.com)
11. Use green energy.
12. carbon free travel and holiday.(vacation)
Reduce the carbon dioxide emission offsets to zero.

The golden standard of a Clean development mechanism(CDM) is the objectives of the Kyoto protocol. Keep the planet clean, pure, lessen the greenhouse gases, and keep it cool and safe for life to continue as before. In the book Flexibility in climate policy Tim Jackson, Katie Beg and Stuart Parkinson has described how to make the Kyoto mechanisms work the joint implementation(JI) its objectives, social and environmental

aspects ,methodology and case study research. The many project case studies using biomass and wind energy are interesting and we should be thinking in those lines and using less of fossil fuels. This is the only way to do away with the havoc caused by the Industrial revolution on the globe in such a short period.

Conflict scenario from 2010-2030 anticipated –Peter Schwartz and Doug Randall (Oct

2003)

Asia 2010 Border skirmishes and conflicts in Bangladesh,India,China as mass migration occur towards Burma. 2012.regional instability leads Japan to develop force projection capability.	USA 2010. Disagreement with Canada &Mexico over water increase tension. 2012. flood of refugees to southeast US & Mexico from Caribbean islands.
2015 Strategic agreement between Japan& Russia for Siberia &Sakhalin energy resources	2015 European migration to US 2016.conflict with European countries over fishing rights
2018 China intervenes in Kazakhstan to protect pipelines regularly disrupted by rebels	2018 Securing North America ,US forms integrated security alliance with Canada and Mexico
2020 Department of defense manages borders & refugee from Caribbean & Europe	

In Europe they reported migration from ``Holland &Germany to Italy &Spain by 2020 and by 2007 itself the low-lying coastal areas of Holland are being evacuated due to violent storms. Melting of Himalayan glaciers have relocated Tibetans. The rising sea levels & floods people are migrating. By change in the THC the northern latitudes including UK will become colder drier and akin to Siberia. Deaths from war, famine ,weather related disasters are predicted by the Pentagon report of Schwartz and Randall. Riots of internal conflicts in India, South Africa, Indonesia : Elsewhere Countries exploiting resources of others to feed and care for their own populations ,conflict over water resource in Nile,Danube,Amazon basins,USA &Europe will be mighty fortresses barring entry to millions of starving people ,Scandinavians will move south. Africans will move to south Europe. China's huge population and food needs will make it more vulnerable.Bengladesa will be uninhabitable due to rising sea level which will contaminate inland water supplies.(On 25th May 2009 when Aila struck kolkata and Ganga swelled with its tributaries in sunder bans breaking embankments in 100

spots, and 24 pargannas bore the brunt ,and 100 irrigation dams smashed ,inundating scores of villages at least some might have remembered this prediction!).When fossil fuel is dangerous to human life on earth, and hydroelectric power is destroyed by lack of water and destruction of dam reservoirs people think of other measures of energy sources. The Pentagon report therefore says that Israel,china,India,Pakistan will be ready to use nuclear arsenals and Japan, south Korea, Egypt and Germany ,in addition to Iran and north Korea will develop nuclear capability.

The interesting part is that this is not a climatic prediction, but the impact or effects of climatic changes on various parts of the globe on a regional basis.So,what was wrong in Varahamihira and his predecessors giving this type of predictions to rulers and people to be on the look out for problems and solve them before they came ?The west is gradually adopting the ways of the ancient east, because only now have they got the scientific knowledge of the weather, of the seas and its relation to human activity.

The role of eclipses and earthquakes due to expansion of water bodies during eclipses were predicted by Indian astronomers. If we look at the following figures you can see how the major disasters of earthquakes wiping away populations had occurred on either new or full moon days.

2001 Gujarat earthquake killing 20000 people on new moon day

Dec 26 in 2004 the famous tsunami on a full moon day.

26th September Japan kurile island earthquake on new moon day.

Dec 26th 2003 new moon day Iran earthquake kills 30000 people.

The European travels to India in 15th to 16th century and the events thereafter was their study period of the human behavior and knowledge of sciences .It took nearly 400 years for them to accept it, but by that time, they had altered the entire global weather by the greed for more power and we have to face the consequences of what we call the great industrial revolution. We have enjoyed its good effects so far. Now we have to suffer the bad effects too. For surviving the climatic changes and to avert the catastrophe of manmade changes to the weather We have to

1 understand the problem of the gravity of the human-made climate change

2.We have to break out of the present impasse.

We include all of us, and the policy makers, opinion formers, the rich, powerful and influential in corporate business ,academic and scientific institutions and leading nongovernmental institutions .

I am a music lover. Music integrates everything. And intelligent time measure and design is part of music, medicine and astronomy all of which I have learnt.Music is creatively

alive and is very precise about counting. Timing and tuning to shared reference points are fundamental to powers of live music. It has a timeless stability and political relevance of equality and oneness of everything and a very peaceful eternal dharma of sustenance of life. All conflicts can be solved with such peaceful intelligent integrating processes.

And if science can make us aware of the dangers of global warming it can find out a way out of it too. Therefore ,all of us together can solve the problem, if we so desire. If we survive, it will be by our combined effort. If the civilization and humanity perish it will be by our shared action of selfishness. What do we want ourselves to do is our own decision.

When the entire world economy is in recession,Indian economy shows signs of recovery ,but Industry and services sectors help offset lag in agriculture.The agricultur and allied industries sector has fallen back .The output of food and cash crops in 2008-09 had a record output of foodgrains.The estimates of the NEAC are based on different perceptions .It places foddgrain production at 233 tonnes against the Agricultural ministry's 221 million tones.NEAC thinks food and cash crops will be much lower than this in 2009-10 .But overall progress of economy is satisfactory in the context of a projected contraction of global economy.(P.A.Seshan The Hindu .9.11.2009)

The growth of Indian economy (Growth in % at 1999-2000 prices):-

APRIL-JUNE(Q1)2008-2009		APRIL-JUNE(Q1)2009-10 estimate
Agriculture,forestry ,fishing	3.0	2.4
Mining,quarrying	4.6	7.9
Manufacturing	5.5	3.4
Electricity,gas,water supply	2.7	6.2
Construction	8.4	7.1
Trade,hotel,transport,communication	13.0	8.1
Financing,insurance,real estate,Business service	6.9	9.1
Community,personal,social services	8.2	6.8
GDP at factor cost	7.8	6.1

What we have to do is increase growth rate in agriculture and allied industries ,and use energy from natural sources (solar,biogas etc)and reduce construction in cultiviable areas .That will provide ample food for our increasing population,make us selfsufficient and wealthy .Since India is primarily an agricultural land with a favourable monsoon and geography for luxurious growth of natural vegetation make use of that natural wealth and recycle bioenrgy by Krishi, Goraksha and fish culture and reduce the expenditure on agriculture by self help and by co-operation of entire graama is the best policy to be adapted.

While I write this the southerly winds brought rains to Chennai unexpectedly and a pattern shift was noticed in rainfall here.The suburbs got more rains than the metro city.Meenambakkam and suburbs got good rains in NE monsoon .A new phenomenon noticed is the shift of rain and variation in this manner as shown below.

November Date	Meenambakkam	Nunkambakkam
6 th	40	30
7 th	105	91
8 th	133	123
9 th	45	27
10 th	13	6
11 th	32	21
15 th	58	47
16 th	37	21
18 th	48	1

Usually Meenambakkam observatory receives more rains from southwest monsoon winds caused by thunderstorm activity which develops in interior rather than along coast .And the North east monsoon is active over the city than in interior areas like Meenambakkam and Tambaram.According to S.R.Ramanan,director of RMC,the heavy downpour was caused by the southerly winds which blew unexpectedly bringing rainclouds in their wake.Thus there is a shift and reversal of winds at least ,noticed only in Chennai but possibly in other areas which is not yet noticed by the people and officials.And the same phenomenon cased a mishap in Oottakamandala(Udaka is water) or the cycle of waters and its effect were seen as floods in Nilgiri,in Chittur and Palghat including the Kottayi gramam of Chembai Vaidyanath Bhagavathar in suburbs of Palghat.This though a small scale floods was like the floods of last year in Bihar caused by Nepal's opening up of a water resource in Brahmaputhra .When a king/administration gives orders to open up water from above sudden floods happen in land below .To prevent that in olden times same administration was there in upland and down below.That is how Mithila(present parts of eastern India including Bihar)and Nepal was under one king attached to the dynasty of Ikshwaku,Suryavansi in Ayodhya.The same was true of Nilgiri Vadamalappuram,Thenmalappuram and Konghuchera beyond Palghat pass under one king .Now we are under one center but the states and their Govts have taken up a policy of infights over water resources for no reason at all.

At the same time both TOI and Hindu reports that for the first time in two decades India is trying to import rice .This is said to be to make up shortfall in kharif crops eventhough it has surplus stock in godowns.This statement is controversial If there is enough in the godown and if we expect a good produce due to high rainfall this season why this haste to import grains?According tour Government estimates kharif rice output is likely to fall 18 %to about 69.45 millions tones due to pooor monsoons leading to a shortfall of about 15 million tones in 2009-10.The SW monsoon this year wa 23 % below normal ,the worst in 37 years.According to US department of agriculture (USDA)India is the second largest producer of rice in the world and if it has to import 200000 onnes of rice at a greater price than the domestic market ,to meet its domestic requirements ,how can we call our administration as efficient and our citizens as educated and concerned about our national economy and growth?Global tenders are floating the market and by the announcement of the finance minister they are increasing their prices ,since there is a demand .So where would it lead Indian economy to?Should not we co-operate in every possible way to cope up with food sufficiency since India is a tropical land with a agrarian economy of great

strength and we should know our strengths and weaknesses .By promoting other things and neglecting agriculture we are digging our own grave.

Evidence of Indian influence in foreign lands.

From lower Mesopotamian plain(Sumer and Akkad)to the Baluchistan(Kulli culture) which was called the Kekaya in Indian scriptures, and to Indogangetic divide upto Gujarat ,the entire area (except Harappa) share one geographic feature. Arid and semiarid climate with summer draughts ,unevenly distributed and unreliable rainfall in winter, less than 250mm per year. Therefore an agriculture based on winter agriculture and herding of animals like sheep and goat was predominant in these areas.

From Gujarat onwards the entire west coast of India has a monsoon rainfall. The upper Ganga Yamuna doab is transitional between arid Indus plain and monsoon Gangetic plain is the eastern limit for winter farming in the north of the subcontinent. The Thar desert is a physical and cultural divide ,but once it was fertile and was nourished by the Saraswathy and its tributaries which dried up later leading to the desert climate. The easternmost manifestation of the arid zone is the Harappan culture .

The environment ,economical potential of each of these regions helped exchange of trade and local fertility and differences in produces,and mineral resources and sociopolitical conditions made the organization of trade and commerce possible.Afghanistan with its inaccessible north east mountains of it was the ancient Gandhara (Khandahar now) of India.

Kekaya and Gandhara were parts of India and Indian kings were ruling there and their daughters were wives of Indian kings.Dasratha,Dhritharashtra and SriKrishna had wives from such regions. Therefore they were very much involved in defending the Indian subcontinent from outside invasions and acting as controllers of trade and commerce and the trade routes to the west by land. The land route from Baluchistan and Khandahar (Kekaya and Gandhara in Indian scriptures)is first mentioned in Ramayana .The same route continued to be used in the 17th century between India and the west.(part 2,Chap 3 Neils Strengard in Sushil Choudhary and Michael Morineau Cambridge Uty press 1999).This ancient caravan route linked India to Persia and markets further west by way of Khandahar.Its vitality is documented.

1.Isfahan through Thatta ,along Kabul to North west Mints of silver

,Lahore,Multan,Thatta,Kabul,Khandahar.

2.Steel and Crowther on 3.4.1615 starts a journey ,reach Lahore on 23rd ,delayed by inability to get a permission, on 29th joined a large caravan, with convoy of horsemen (just as in Ramayana).Reach Khandahar on 7th July. This was the frontier post of India (Mughal empire)and a nodal port of caravan traffic. But it yielded nothing but provisions to travelers. Camels could be hired at 20 % profit. On 23rd July left Khandahar with 3

Armenian and 12 Persian merchants. On 27th reach Girisk in Persia 8th August Farah where import duty has to be given. Beyond Persia horses, slaves, gold, non-Persian silver coin and export was not allowed. 9th August leave Farah. Deserts crossed with oasis at Birjand and Tabas. They bypassed Yazd, off the main route. Reached Isfaharn on 19th September.

3. Poser in opposite direction.

Start on 18th July 1621. On August 1 reach Yezd center of silk industry. No freshwater for 3-4 days being in desert. In Tabas, Birjand saw windmills. On Sep 2 in Farah where irrigation works and size of fruits are recorded by traveler. Here a Persian and an Indian chief of the same caravan and an official from the local Government inspect all people, baggage, etc and there is a small charge for the hired camel. He fell ill on Sep 12th. On 14th at Girisk. There he finds a strong castle which could be supported just by the caravan revenue (showing the busy trade). It belonged to the Indian Mughal emperor. Fresh milk and fruits were the only food of the caravan and no meat, wine or brandy was allowed. He had to pay 5 and ½ shahi (silver) at Girisk. He saw people drinking tobacco there. 18th September leaves Girisk, cross Helmand river and reach Mughal India proper. On 21st reached Khandahar. It was a busy important town. He saw elephant for first time in life, there. Busy trade, thousands of camels entering and leaving daily. Cotton and textile trade, tobacco, and wantonness of multitudes of prostitutes in Khandahar is described. When they left Khandahar the caravan had 2000 camels. On 30 September left Khandahar. Travelling through mountains he saw the big stature of the Aquadi who brought sheep, butter, and rice to sell to caravan. After 16th October reached banks of Indus river. He felt he had reached another world. 5th November he is in Multan (Moolasthaana). On 23rd reach Lahore and visits a Venetian who looks after churches in Lahore on behalf of the Jesuits in Agra. From Lahore, broad roads, with planted trees on sides, many markets and open places. Passes Sirhind, an open countryside, with green irrigated plains, birds, cattle, sugar production. He describes red sugar that tastes like white sugar. On 22nd Dec reaches Agra. Total days taken 158, as against Steel and Crowther who took 170 days.

4. William Foster's early travels in India. 1583-1619 Oxford 1921. pp 243 4 months and odd days from Isfahan to Lahore. From there 1 month to Agra.

5. Covert. 1609. Jai salmer and Sukkur from Agra to Khandahar is the shorter route. but he took 182 days.

18.5 shahi per camel in 6 places by Posen

56 shahi in 9 places by Steel

Security was satisfactory especially if caravan was big. Thieves were present within caravan. In 1621 tobacco use was widespread there.

In 1610, there were 7000-8000 camels stationed to and fro in Khandahar

1615 it was 12000-14000 report of Steel.

Same year Thomas Coryat 2000 camels, 1500 horses, 1000 odd mules, 800 asses, 6000

people.

1617 Sir Thomas Roe 20000 camels per year

1635 From Khandahar 4000 camels reached Isfahan with cotton

1639 Cotton from India carried by 20000-25000 camels

1644 only 6000 camels

1655 only 1000 camels.

Colonies of Indian merchants lived in Isfahan. In 1618 an English merchant wondered why Indian merchants are selling linen of India in other places while their people are walking naked. In May 1610 Henry 1V was assassinated. The news reached Agra in August 1611 when a caravan reached (within 8 months) and Bhagavatham rightly says the merchant class has the duty of bringing news/messages (Vartha) in addition to their common duties of trade, commerce, agriculture etc.

The evidence for support of business and administrative infrastructure including custom duty and periodic check up, security of property by armed people etc shows the ancient trade route was very well under a strong unified regime of administration. This continued from Ramayana times upto the European times from our literature survey. The network developed by bonds of solidarity and trust based on common membership of one nation identified with another that was on many levels a national substitute for the

state. Sometimes ties of marriage strengthened the trade routes and the relations of the two partners in trade and commerce. An unquestionable cultural unity and cohesion was provided by trust and solidarity. Transmission of technical knowledge into a special language and specificity of such knowledge was also part of the phenomenon. There was a school to teach the people and the merchants a specialized education, the commercial geography, weights and measures, currencies, arithmetic and accountancy and these existed in each village and in specialized centers. The specialized use of arithmetic language foreshadows a parallel in the accounting methods used. They had a reliable system with a kind of promissory note which involve four or more people at long distances and repayment deadlines were the travel times. For example from Amsterdam to Basra via Venice it will be 7 months Swat to Isfahan is 105 days, Dacca to Calcutta is 15 days, like that. Only the degree of mastery of the sea and substantial presence of continental continuous trade helped to strengthen the networks and the major sea networks were monopoly of sea merchants of coastal India and their overlords so that it was unified system.

What was the commercial relation of India and Ottoman empire in late 15th to 18th century? In 1503 Ludo Vico de Varthema found merchants of Iran, Tartary, Turkey, Syria, Maghreb, Yemen, Ethiopia and rest of India and the inhabited islands of the sea in port of Calicut. Iron, steel, neel (indigo) and cotton of India was in demand in Basra

(Baghdad). In 1583 English traveler J. Eldred wrote :- To Basra come monthly divers ships laden with all sorts of Indian merchandise ,spices,drugs,Indica and Calcut clothes.

1610. Caravan from Baghdad to Aleppo carry Indian goods via Basra (fabrics,indigo, perfumes) and there were 120 merchants in it including Indian and Italian ,Iranian and from Baghdad. In 1624 Hormuz captured by Safavid sovereigns. In 1638 Basra regain its importance. In 1680-90 the custom regulation of luxury clothes of India
Records

11 kinds of Muslin to make turbans

5 types of Quilt (cotton+silk)

4 types of satin

11 types of Ikates fabrics

7 types of bafta (a type of calico)

5 types of costumes

Chintz in 5 colours

The major entre port for Indian articles was Red sea into the Ottoman empire. The pilgrims to Mecca were the potential commercial agents. Gold was exchanged for Malabar and Bengal muslin and chintz at Mecca

Banias of North India and Armenians used the land routes mainly. The Armenians ,Persians ,Europeans were only intermediaries in the movement of merchandise till 18th century .Indians and Ottoman people were direct trading partners .The Ottoman Turks include the Arabs or the Kurds and orthodox jews from Turkey. It is interesting that the Sultan of Istanbul did not send trading merchants to India as he did to Moscow to get furs. The Indian products to him were always gifts (fine clothes,spices,drugs ,perfumes ,precious stones) and this was a very ancient custom due to solidarity and relation with old Kerala .The Ottoman apothecaries called Indian Tamarind as Demir Hindi or Temur Hindi (which is dramila or Tamila India/sindh) and from this the name tamarind originated in English language. Mecca pilgrims carried aloe wood of India in baggage. Also pacholi,sandalwood,bezoar from Golconda. From 1620 only the transport of spice route was obstructed via the red sea. After that the transport became more via the Atlantic. The Basra records show Indian spices,nutmeg,Indigo of Ayra(? Ayiramala of Kottavai in sangham era or from Ayirur of Kolathiri in Kuranad) and it was second costliest after lapis lazuli of India.

English Chintz

Hindi chint

Mahratha tchit

Malayalam Cheenthu

It is a hand painted cloth ,the oldest dating is from 1548 for cushion, mattress etc India exported day to day domestic use clothes as well as luxury clothes right from prehistoric upto 16th-18th century.17th century Ottoman historian Naima wrote “The Indians do not buy anything from Ottoman territory. They find nothing they need here. They have no needs to satisfy in foreign countries.”

This shows how self-sufficient Indian economy was at that time. They were self-sufficient and they were giving the surplus to others and strengthening the economy. This shows a good administration ,not a bad one. Then how did such a sudden imbalance happen? The relation of forces after and before 1498 (which is modern period in west and medieval in India)changed and we will see that in another chapter.

The oldest written evidence of humanity is the Indus script which is not yet read by scholars. The next important written texts are the cuneiform tablets and they give us sources of their goods and the destination of their trading ships as Dilmun,Magan,and Meluhha.In the 3rd and 2nd millennium BC these were urban centers as per cuneiform texts. The kind of goods were both raw materials and manufactured ,utilitarian and luxury items .The notion of trade as sea route and land route was known to them and involvement of state in trade and agrarian produce and economy is demonstrated by seals and texts of antiquity in these regions as well as in India. The west of Afghanistan,now not belonging to India but the old Gandhara of India ,bordering Iran was a source of copper and tin for Harappan culture and it helped metallurgy as well as agriculture, production of crafts .It was utilitarian good for India .The luxury items were for social relation with kings and rulers for gifts etc .Mesopotamian royalty was the major market for Indian luxury. For decoration of their temples they got fine timber ,gold, lapis lazuli,etc from India. Origin of settlements like villages started the local trade and initiation of self sufficiency and the urban centers developed as the trade and commerce with foreign lands of great distances increased .Urbanism refers to spatial ordering of the community ,other than subsistence procurement like crafts,mines,transport systems, taxation for trade etc.Clustering of nonfood producing population created opportunity for agricultural produce to be traded locally. The concept of food for all and raw material and fuel for the manufacturers developed. In exchange the cities gave goods manufactured and services of various kinds to rural people.

The archeological evidence show that in Ubaid period (5th millennium BC)Eridu,Ur ,Ubaid were settled villages and people were herding and fishing in marshes. The cereal cultivation had just started. Reed huts and mud brick houses were used. No ceramic production seen locally. But in the early shrine of Eridu a clay model of boat with socket for mast is seen in a grave showing knowledge of boat with use of a sail. Seasonal sea fishing expeditions from Sumer was probably there.Uruk period from 4000-3000BC we find architecture,sculpture,cylinder seals. There is an 100 hectare settlement ,with evidence of 8 successive cultures. Home of legendary Enmarker Uruk show some

writings. The first writing appeared in the terminal Uruk period. It was picture like signs on tokens and tablets for economic transactions and it corresponds with the Indian civilization period of Vedavyasa and Srikrishna according to Kaliyuga calculation. The port city of Dwaraka existed till 3104 BC. The temple of Eanna for Ishtar uses copper, gold, silver, lapis lazuli, cornelian, basalt, chlorite, marble, and limestone. Only limestone is locally available. All others are imported. North and south Uruk had pottery but no Uruk pottery is so far discovered in gulf (pp11 Q. J.Oates and D.T.Potts Shereen Ratnagar OUP). Ninevah on the left bank of upper Tigris an important center on route from North Iran, Anatolia, and Gulf on excavation show artifacts of Uruk type.

At Muscat the discovery of a plank boat (construction and repair) around 3100 BC with bitumen mixture heating was seen and this is the time of decline of Yadavas of Gujarat and loss of Dwaraka in India.

The westernmost Harappan center is Sukthagon-Dor which is fortified to prevent invasion from west and a local culture of 4th millennium BC exist there (before Uruk period and before Krishna). Prehistoric Baluchistan (Kekaya) link with Turkemia (Quettaware) is established. At Mehrgarh also the connection is seen. There along with lapis, carnelian, gold, silver ornaments, ornaments of shank shells from the sea of south India and south East Asia had been identified showing how wide the trade relations were. Mesopotamia:-

Arid region. In 3000 BC the seed harvest ratio was 1:70. due to annual floods of two rivers. The stock rearing of sheep and goat was known. In 2600 BC. One temple had 14000 goats and sheep. Wool industry flourished (1Kg wool /animal). Moving pastoralists were part of economy and sharing of trade goods. In March /April the spring shearing of

wool, they enter silted zones and exchange wool for necessary goods. Harvests over, they graze and fertilize fields by droppings. The trees were poplar and willow, tamarisk, and date palm. It gave charcoal of bad quality and used for roof beams for ordinary houses. No wood of strength and durability existed for cart frame, boats and ships and for temple pillars. These were from far off places and through sea route. Standing at the head of the gulf south Mesopotamia traded with east and south East. In their writings we find that Ur, Lagash and Akkad were proud of foreign ships visiting their coasts. They say the foreign ships brought wood and metal to them through water transport. In ancient times Ur was one of the southern cities and Jacobson says (1960.185) the water body as a marshy lake, seen south of Ur was in ancient times a part of gulf.

The trade relations of Mesopotamia with South Asia is proved by archeological findings and exchange of several articles including seals, weights and measures and trefoil figurines on ox/bulls, Indian bull figurines, cylinder seal of rhinoceros with a bead on its face, of elephants, ghariels and a lapis lazuli amulet showing two Indian elephants, and two seals with water buffalo of India which is not a feature of Mesopotamia.

But the ships bringing wood from Dilmun and copper for which barley, cedarwood and flour were exchanged is mentioned in texts showing the nature of daily use materials

exchange .On Nippur statues in the time of sargon,and from the historical account of curse of Akkad we have important information about the nature of trade relation with India.

The Akkadian dynasty of Sargon had three generations .Son of Sargon was Manishtusu and his son Narain Sen who defeated a Magan king. The names of the kings are definitely Indian especially the first and the third.

Jacobson has read the historical text of curse of Akkad and given an English translation quoted by Rathnagar in her book. I will just quote a few lines from it here.

1.Sumerians ,Martu nomads, and Meluhhas came to Akkad.

From Sumer's own stones

Barges were towed

The Martu of the highlands

Men who knew not grain

Were coming to her with perfect bulls.

Perfect kids

The Meluhhans,men of the black mountains

Were bringing down

Strange goods to her from them.

That means the barges were of Sumer's stones but the ships were foreign. The Martu is the Sanskrit Maruthu or winds (49 types of winds)and the monsoon winds bring high fertility for grains .They brought to them grains and bulls (ploughing bulls)and their children which were perfect breeds in every way. they also brought strange unfamiliar goods from the Meluhha country which is the country of black hills.

2.BC 2125 epic inscribed on cylinder A and B Gudea of building a temple and acquisition of materials for it:-

The Elamites came to the king from Elam

The Susaine from Susa

The Magan,Meluhha in the mountains

Loaded wood upon their shoulders for him

And gathered to build Ningaristu's home.

3. Carnelian they were lavishing on him from Meluhha.

4. Gifts before the deity:

Chariot, special type of maces, weapons

Copper, tin, slabs of lapis lazuli,

Refined silver, pure Meluhha carnelian

He set up in a huge copper pail.

5. Statue A inscription:- Diorite from Magan mountains which the statue was covered.

6. Statue B inscription:- Diorite come from Meluhha together with gold in its ore state.

7. Statue D inscription:- Magan, Meluhha, Gubin and Dilmun sent wood. They let their timber cargoes sail to Lagash. Meluhha is blessed with large cattle and trees

8. The speckled dogs of Meluhha was brought to Ibbi-Sin of Ur as a gift. The area was also a source of carnelian beads. (This gives us the clue to the fact that Meluhha country or Mlechadesa in Sanskrit was Kekaya of India. The gifts of King of Kekaya to Dasartha

through Bharatha, his grandson included speckled spotted fierce dogs of a superbreed variety special to Kekaya. To this date such mastiff dogs are special for the region. The UR dynasty and its empire fell in 2004 BC and we find the trade contact till that date from Indian Kekaya.

But was Kekaya or Baluchistan a black mountain which grew lot of trees which gave it a greenish/bluish black color? No. But the organized trade and commerce of India made it possible to get wood from the Sahya and transport it by ships with help of monsoon winds and the black people of Mlecha country (Krishna) were known as a single community from entire Sindhudesa to southwestern India.

We cannot consider the Gulf coast taking part in this ancient trade. Because Akkadian Ur fell by 2004 BC and the Arabian coast of gulf was uninhabited till the oil was struck and the Bahrain culture starts in 1500 BC and Kuwait culture starts in 2000 BC well after the SUMERIAN/AKKADIA civilizations fell. But in 1900 Dilmun (Bahrain) had sent Indian ivory, carnelian, gold and fisheye (mother of pearl specific for Bahrain and Gulf coast) lapis, copper, wood of good quality, wooden objects, Guhlu etc none except fish eye is the product of gulf but of India. Guhlu from Dilmun is translated as antimony. The term resembles Guggulu a medicinal substance for heart diseases is my observation.

What was taken back by Dilmun for exchange of such costly things from Mesopotamia.? The answer is very significant. For such superior quality articles,Dilmun ships took back inferior quality wool, and garments, leather goods, silver and sesame oil.

Articles from Dilmun to Ur	Source of ref information(archeological)
1 Carnelian	UET V
2Semiprecious stones	UET 3 .672; UET V ,;UET 1244
3.Ivory and Ivory objects	UET 3;UET V;Urik archaic text DP 237;513;518,RTC 26,VS X1V 30,38,194,UET V UET V 796 Expecting a very large quantity
4.Copper	
5 Silver	D.T.Potts 1990 227 says susa texts dt 1720 BC 17.5 Manna silver
6Lapiz lazuli	UET V Texts
7.fish eye	same
8.red gold	Same Tablets
9.white corals	same
10.wood of good quality	UR ,Gudea statue D ,Cylinder A,UET V
11.Dates	Enki,Ninhurag
12.Bitumen for ship repair	YOS 5 ,Larsa pd text

This shows Bahrain or Dilmun was acting as an entre port for trade of Sumer,Akkad and India (west Asia)and was not a trading partner for them. For acting as entrepot they received the inferior quality articles from Mesopotamia and probably from India they got

some grains or food material and clothes for day to day use and the art of repair of ships was taught for mutual help.Cylinder A passage mentions transport of wood and huge amounts of food grains. In the deluge myth of Akkad,Zinsudra escapes deluge and allowed to live in Dilmun ,a place where the Akkadian sun rises and called the land of Crossing.(to east of Akkadia and the crossing point or entre port of India and Mesopotamia in sea trade. Before 2000 BC there was no fresh water in Bahrain and people could not settle there. In a 3000 BC profession text ,a tax collector is mentioned showing that the export trade was well organized and state controlled by the trading partners. The Magan contact is mentioned from Akkadian period only and not in Sumerian period. Oman has copper which is mentioned only after Akkadian period. The reason for this is:-

1.Dilmun may not be a specific geographic name for Bahrain only ,but included other islands also

2.Dilmun acted as a middle man since they were using the weights and measures of Harrappa and IVC and did not have weights and measures of their own.

Why is the Maruths of the highlands of India called the men who don't know grains and

the black men of the black mountains of Mlechadesa said to have brought good wood and well-bred plough bulls and calves for agricultural use?

The answer is simple. The Upper highlands of Baluchistan (kekaya) and Gandhara (Afghanistan) were not cultivable lands and had only limited pastoral life. Stretches of uninhabited land near settlements with artisans living and manufacturing goods was the picture. They needed grain and it was supplied by organized trade from the fertile southern regions of India. The manufactured goods reached through trade routes all over the world. The South East of Bampur Valley lies Baluchistan and North East is Kerman region to Seistan. SE Zagros zone is Soghan valley through which flow Dozdan river to gulf of Oman in the vicinity of Minab which is a fertile district and if one walks for 5-6 days through this riverbank, one can reach the sea coast from Yahya Tepe. Downstream the Soghan valley 24 Km southeast of Dolatabad lies the copper deposits and large quantities of slag is visible. Steatite specifically chlorite is seen in 4 locations here. Therefore from Neolithic to Sussarian times Tepe Yahya had human settlements and in early 4th millennium BC thirty settlements were in Dolatabad. By the time of Yahya IVC period most of these settlements were abandoned. In Yahya period IV c, a storage building complex where the consignments were stored and dispatched existed. They stored lapis lazuli, solid foot goblets with flat base unlike the hollow conical foot and conical cup forms of Barber 1 period. The sequence of organization and transport of culture and materials is from east to west and not from west to east or downwards from north. The South provided food and raw materials and available minerals along with rich forest products and gold and the northern India and North west provided great manufacture centers of copper, chlorites, and other minerals and metals and metallurgy became specialized and export quality. The entire trade from Kanyakumari to Gandhara and Kekaya was well organized through sea and land routes

and this made the land self sufficient and could give surplus to Babylon and Akkad and Sumeria through organized state administration. The concept of a organized ekarashtra is seen in Mahabharata and The ekarashtra is Brahmanda(universe)itself and Bhartha was only part of this ekarashtra and was sharing its valuable products for cheap things which she did not need but the entrepots needed in exchange. By the development of organized specialized professional excellence and knowledge and sharing by co-operation she had learned and taught a new system of successful administration based on confederation of self-sufficient republics of several panchayaths and nagara .

The Helmand civilization and Gandhara:-The Helmand river originates from the Hindukush mountainous highlands and forms the Hamun-I Helmand in Seistan. One of its tributaries Arghandab flows through Kandahar and meets Helmand west of Kandahar. The seat of Shahr-I Sokhta and Helmand civilization is this part.

The names Hamun-I and Shahr-I strikes a familiar chord in our memory, because the name of the Gandhara prince who accompanied Gandhari to Hastinapur was Sakuni, a unnatural name which looks quite different from other names of the epic and if written as Sakun-I it is a Gandhara name. The Hamun lake the only fertile region of Iran is changing dimensions year to year and climate is bad for agriculture. The notorious winds

of 120 days (from May to October) creates havoc on soil, vegetation, sand particles act as abrasive, erode soil, strip the plants of their leaves etc. The whole stretch of lands from this to Nepal is the land of the Northern Maruths, as described by Akkadians, but the Nepal is geographically different from Iran and has cultivable lands though a land of winds. (Many of the places are having the suffix of Hawa or wind attached). This stretch of land is on the silk route. The wheat and cattle (animal husbandry) was practiced and mats, weaving, wool spinning etc were occupation of people. Quartz, alabaster, flint, marble, calcite, are available in Seistan, the seat of Sassanian and Parthian kings. (Sassania is from Sasaadha and Parthian is from Bharatheeya and these are Corrupted local usages). Silver, lead and malachite pebbles (same as in Mundigark) is seen in the south. To the east the Helmond leads to Kandahar and Mundigak settlement. Helmand river is not navigable in any part and hence the transport is only by land route.

One important archeological find is that in grave 10 of Shahr-I-soktha which is the limits to Baluchistan (Kekaya) one finds shreds of earthen pottery and vases and a collection of Shank shells from south Asia on the surface of the mountains showing that it was a confluence place for three civilizations Central Asia, South Asia and west Asia. The total area of Shahr-I soktha is only 151 hectares and the other settlements are only the size of small villages not more than 2 hectares. The time span is from 4th millennium BC to end of 2nd millennium. Only 2000 years did that civilization exist. It was not continuous as Indian, but had features in common with Indian and was acting as a boundary and transport center for trade and commerce. Shahr-I soktha has scarce evidence of long distance export-import and only connection is with S.E. Iran. On the other hand Mundigark near Khadhar which has an agricultural production stretch of present Afghanistan and old Gandhara, was the node of a very ancient caravan route from

Herat, Indus plains, Sibi, Quetta, Kabul and Ghazni. It is not in the fertile Kandahar plain but 50 Km North, separated from a hill spur and the routes used by pastoralists (Idaya/Yaadava) who go to Gandhara plain for the winter sojourn. (Rathnagar pp 67). The eccentric location and an important deposit of Galena gave importance to Mundigark. The layers of occupation predates Shahr-I soktha by 1000 years. But it became an urban center only in 3000 BC -2000 BC with a defensive rampart and a palace. (That was the time of Mahabharata and Krishna and of the rise of Kuru race and sons of Gandhari). The people used metal, stone, seals, and a workshop and two carved ivory artifacts are excavated from here which does not exist in Shahr-I soktha. Iranian Baluchistan (The Bampur valley) with mountain ranges, plateaus, winding river basins, low troughs is a desolate zone of base rock and sand dunes. The size and number of human settlements are limited. The major diet is fish from a perennial river. Pastoralism, seasonal migration for high pastures on Makran ranges and Sarawan plateau still exists as prehistoric times. The only surplus they have is wool and ghee. The household equipment is minimal. Palm leaves used for making huts, tents, mats etc. On North Bampur valley opens to river Damian's tributary near Irahshakr and here there is cultivation and on its east margin lie Katukan. On east is Bampur and Mashkel, once a part of the Seistan empire.

River Halil Rud from Kerman area, and to south towards Makran ,empty into Hamun-I Jaz Murian ,a low trough at center of which is the famous salt lake.Bampur river empty into salt lake from east. Thus the natural route of communication existed between Kerman ,Makran,Halil Rud and Bampur.In SE direction, the Halil Rud-Bampur route continue to Serbaz and then Kej valley and on NE to Rakshan and Mashkel valley. An old route connect Bampur to Char Bahar ,which is an important settlement and harbour on Makran coast .On the north a route leads to Seistan.

Thus copper traveled to west of Halil Rud near Faryab,lead to Kuh-I –Jebel Bariz,both copper and lead to slope of Kuh-I Tuftan,and copper to Northern slope of Srhadd from here.Mundigark and Mohenjodaro was in constant contact with Bampur and this caravan route and intermediate centre of distribution. This connection continued even during Buddhist period as we see the Buddhist idols of that period in plenty here.

Now we have seen how the land routes of India and Babylon/Akkadia was established and how the ancient caravan routes connected the two sides of the globe.Now we have to locate the Magan mentioned in Sumerian/Akkadian manuscripts,because Sargan was receiving boats and ships from Magan,Meluhha and Dilmun and Dilmun is the entre-port Bahrain ,and Meluhha is the Mlechadesa called Sindhu-Souveera in Sanskrit.

Sargon's son Manishtusu sailed across the lower sea and defeated 32 towns of Magan and cleared the way for metal and silver mines ,quarried black stone of mountains of lower sea, loaded it on ships at the quay of Agade.Narain Sen,his son, subjugated Magan ,captured its EN(ruler)quarried diorite in mountains and cursed the sea and defeated Magan ,and washed weapons in lower sea according to his inscriptions.Gudeas statue inscriptions say Na4 esi from Magan was taken in Magan ships of wood.(This is same as

diorite/dolerite).Gudeas statues are made of it. It is dark hard takes lustrous sheen when polished. It was used for Akkad and Lagash architecture and came from Magan.In Ninurtha myth it is said a special mace was made for him with diorite from Magan which has silver around it.Gudea made his own statue with it and kept in temple.

Magan is a land of sailors and merchants according to the description but none of 3rd millennium cultures of Iran had substantial maritime and shipbuilding knowledge. Chahbar was the only natural harbour on the whole of Persian coast .Magan is said to be a land of mines and copper came from there to Sumer.What else came from Magan?

Haluppu wood for furniture ,chariots but not for ship-building.

Mesu wood for vehicles and furniture only. Not good for ship-building

Darius inscription call it Yaka in old Persian language which is equivalent to Yaksha in Sanskrit(The yaksha wood from land of Yaksha,Kubera who is a ruler of Himalaya ,including Nepal upto Lanka in south according to Ramayana).It came from Gandhara and Karmaana(Kerman)and is Dalbergia Sissoo called Yax or Jag in local Kerman.Yaka/Mesu is Sissoo.Magan reed is bamboo which grows in Makran and bamboo pieces for export is excavated from Harappa.

Sar-Ma-Gan is onion, garlic and asafetida of India traded between India and Gulf through Kerman where it is grown for trade. Red ochre is another.

Magan is old Persian Maka /Makaran (Mahaa/Mahagrihan) and the present Mehrgarh. Ivory from Kerala and Karnataka went to west and barley and wool came from west through Makran and Makran /Magan thus formed an important link for commerce and trade. Grave 8 of Shusin (read as Susena) in 2330 BC, just 1000 yrs after Dwaraka sank, there had been a flood and famine in India and Magan received 70-600 gur (21000 to 180000 liters) and barley from Ensi of the town. In the reign of the last ruler the dynasty records a merchant who took delivery from temple of Nouna of consignments for purchase of Magan copper and wood in exchange of fish, garments, hides and sesame oil. The texts say lapis lazuli came from Mehruhha and Aratta valley but not from Magan. Arattaka desa is mentioned in all ancient Sanskrit texts as part of India and it was a Yadava country. And Mlechchadesa is that part of India where the people do not follow the Vedic injunctions correctly and speak a mlechabhasha or prakrit regional language. In Akkad period and UR 111 texts reference to a man Lu-ma-gan (or Mr Magan, man of Magan) is seen. It was a trade center subjugated by Akkadians and a trade partner for Sumerians from where Magan came. In India also mention of Maaga Brahmana is seen as experts in astronomy, and philosophy as well as architecture. Harappan people had strong links with this area and both Harappa and Maagan were part of India itself. There are settlements along the major avenues of commercialization and Makran is called the land of passage. Physiographically the route runs East-west and Southwest to North east. During Alexander's period coastal Makran was not suitable for caravan traffic but was possible from Kej valley (in Makran) to Bampur and Sarbaz valley and this east west route's natural eastward extension was Mashkai (Mushkai) valley, Nal, Khuzder, Bela (east) across Nal river to Jhan pass by two day caravan journey. From

Khuzder to east through Mula pass reach southwest edge of Kachi plains (Kachi or Brighukatcha plains start here) Then turn southeast you are in Mohenjodaro. So Mohenjodaro was the centre of the Brighuvansi and their generations of rulers. From Bela to south through Sounmini bay another route runs to Harappan settlement at Balakot

towards the coast of Brighukatcha. Several kulli settlements lay astride land routes

between lower Indus plains and Harappan part of Makran. Rainfall being low and

unreliable population density is less in Makran. Pastoralist nomadism is the

livelihood. The northern Las Bela is fertile and has incidence of sedentary cultivation in

Baluchistan. In kulli culture including Nindowari stone boulders not locally available is used for architecture, of stone terrace and platforms, granaries, fortifications. Why such fortifications for mobile pastoralists? The common houses of Makran and south Baluchistan is of mudbrick and mat even today. From where did the stone come? From where did the labor to mobilize them come? Nindowari in Makran is a Harappan site

and that settles the doubts and the mercantile and co-operative life of Kulli(Baluchistan) or kekaya and Harappan(Bharatha race)people which has literary/archeological evidence from Ramayana/Mehrgarh times .The cart transport is by donkey/camel due to rugged surface of land routes. And fodder for animal caravan is difficult to obtain. The fortification of Harappan port settlement in Makran show some anticipation of threat from some one. Was it from Iranian Baluchistan during times of hardships? The Harappan merchants in the fortified city were residing there to get copper from mines between Hiari and Bela.Their weights and measures in the kulli sites were for that purpose. The Harappan Mesopotamian trade like ivory, carnelian beads, and silver did not touch the Kulli sites. Therefore it is evident that Harappan people used Kulli sites as a periphery of their empire. And as in the village and town planning of India ,the periphery of their empire also was guarded by people of the outcaste who eat meat and do tanning and animal scavenging and are good messengers in times of danger to the interior ,and the inhabitants were the Mlecha of Indian language and Meluhha of the Outside world of Akkad and Sumer.

The Harappan ports of Makran excavated are:-

1.The most westerly Sutkagen dor 650 Km west of Lower Indus ,and thus belongs to Sindhudesa ,the Mlecha land of India.The king of this area was Brihadratha and his son Jayadratha during Mahabharatha days and Jayadratha was husband of Dussala ,the princess of Hastinapura and niece of Prince of Gandhara ,Sakuni .So they were not a different race .

Coastal Makran the uninhabited desert and hilly ,cliffy, swampy arid clay plains and bad water ,170 mm rain/annum and failing rains every 3 years grows only dates ,jowar and barley. No perennial wells ,only a few natural springs exist .Houses are mat made. Fish is eaten and fed to livestock .For dates they get back bread and barley .

2.Tiz .This is a natural harbour located away from monsoon winds reach and hence they could not use monsoon winds for sea travel and had no first hand awareness or experience of monsoon winds/sea route by winds. But it was a port. The materials from southern ports reached here and were taken in exchange for the copper ,wool ,dates etc and then transported to other areas.

3.Dasht-Sukthagon Dor of Harappans.

4.15 Km north of Pasni ,the Harappan site of Sotka Koh.

5.From Sonmani Bay an old route reach 12 Km inland in a Harappan site Balakot with fresh water in deep wells and cultivation with well water irrigation. And 25 Km inland is another Harappan site Khair Kot. (One thing which I notice is that the fortified cities and ports have a name Dor which resembles Dwaraka with same meaning as doorway ,and the suffix Kot to Baala(name of Devi)and Khaira (for artisans or kammala) resemble the suffix Kozhikod or koodam (meaning a center where people meet /kooda or koodastha /kozhikoodam in sangha literature,Irunjaala koodal/chithiraikoodal etc).

The Harappan sites communicated through boat traffic all the year round and into the vicinity including Mesopotamia westward which did not know shipbuilding as their own texts show.

6.Gwador bay and Pasni.The best ports of Makran .now in Pakistan. Well sheltered and with the seasonal Desht river that is tidal for 20 Km .The exclusive Sutkagon dor Harappan site with fortified walls used these ports .Sotkan Koh and Sutkagan dor are on top of a natural rocky elevation(Girigurga).The Giridurga and the Mahagriha (Mehrgarh)of Kekaya is mentioned in Ramayana when the messenger of Vasishta traverse the route to reach there .

Balakot is small .The lowest levels are pre-Harappan .High levels are Harappan period. Shell industry of bangles, unfinished articles, and bivalve shells in abundance noticed. Distance from sea shore of these Harappan sites.

Sutkagon dor 48 Km

Sotka koh 12 Km

Balakot 9 Km

Makran also show early microlithic pre-Harappan and protoelamite sites showing their antiquity.

Harappan civilization is in the stretch of land comprising NW FP ,west Punjab, Rajasthan upto Aravally from eastern limits of an arid semiarid belt across SW Asia and share geographical features with west Asia ,and is a transitional zone and is on the western borders of monsoon India .

In west Asia rain is between November to April. Wild sheep and wild wheat grow in dry winter areas. During this time a high pressure stream enters NW India from west Asia ,one branch of it follow the south flank of Northern mountain ranges. Beneath it low pressure troughs or waves and small winter rainfall follow.

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Food and society –its economical and sociocultural implications to Human beings
Recently I happened to read a very important study by G.Balachandran Pillai (Constraints on differences and adoption of Agromechnical Technology in Rice cultivation in Kerala .2004.Kerala Research Proceedings on local level development Center for Developmental studies.TVM ISBN 81.87621.62).This study points out that

1.The farmers of the Kol lands and Kuttanad harvesting and threshing are the most difficult operations due to labour shortage

2.Shortage of labourers may be due to drudgery of operations such as harvesting

,transplanting and thrashing and because the younger generations prefer white collar jobs outside their village

3.The Kol land farmers are best adapted for accepting the new machinery techniques,because of their well-established group-farming concept among the farming community .

4.The Kol lands have only one crop because in other times there is unfavourable weather and this leads to underemployment.

5.The transplanting was previously done by women and now they are not available for such things as harvesting,transplantation.Paddy trasplanter and vertical conveyor reaper is the only solution now for this problem(and since Kol farmers do accept the mechanization)this is possible to be implemented on co-operative basis.

6.The established group-farming societies called Kol padavu committees as well as the labour union leaders favour mechanization in rice cultivation in peak seasons due to labour shortage.

7.Inadequate custom hire facilities for farm machinery is the major constraint for Mechanisation in Kol lands.The other serious problems are lack of credit facilities and high capital cost of implements .

8.The author also notes that the opposition from farm labourers for mechanization is more in Kuttanad and Palghat Kole fields while in other Kol fields this is not a major problem. (This is an interesting social problem.If we analyse why the farm labourers are against mechanization we get some political equations which are detrimental to the nation and the farm labourers are being brainwashed against their own interests by someone is clear).

I have quoted this study because most of the points he noticed ,I too have noted in my study of Punnayurkulam Parur Padav ,and the solutions to the problems should be based on these.

N.Gopalakrishnan Nair (Measurement of employment,unemployment and

underemployment ISBN 81.87621.75.3 2004) notes that over the years there has been a gradual decrease in the working force in Kerala.When William Logan saw Kerala no woman was unemployed or underemployed and had activities during agricultural season as well as outside of it and man and woman were engaged in a co-operative way in all socioeconomic activities though division of labour existed.Even the women were helping in irrigating fields on a Wheel as he notes.But women as well as men does not go for such activities and depend upon outside labourers for producing food.The dignity of labour we have forgotten .Another study (ISBN 81.87621-84-2 Changes in the mode of labour due to shift in landuse pattern) finds out rapid marginalization of land holding in most parts of India ,due mainly to a disproportionate proliferation of marginal holdings –

both ownership and operational. The households proliferated, the small holdings increased, share in total holdings declined and pattern of intra-generational economic mobility of agricultural households is the explanation for such land distribution. He describes the centripetal and centrifugal mobility (in both directions and towards centre respectively). The first produced polarization and class differentiation among peasants, inequality of land and wealth. That is the orthodox Marxist view. But the neopopulist view is that the centrifugal mobility has diminished the degree of inequality.

The total wetlands Nilam in Kerala according to revenue records is 5.74 lakh ha. The Kerala statistical institute (1992-93) says only an area of 3.33 lakh ha now remains as wetlands and used for rice cultivation. Nearly 1.37 lakh ha are now under perennial crops and 0.35 lakh hectare is used for nonagricultural use. Area that is being filled up and made unsuitable for rice cultivation is increasing day by day.

The topography and climate of Kerala is different from rest of country and Kerala is best suited for rice cultivation. From 1952 to 1997 the share of area for paddy has halved (especially over the last two decades). Rubber cultivation area has doubled and this is followed by coconut and pepper and other cash crops. According to economic survey

1997 during 1996-97 the area under high yielding variety (Virippu 40 %, Mundakan 36 %, Puncta 24 %) is retained and the average productivity of state has remained over national level, though the total area under rice cultivation has declined. This justification is closing our eyes to reality. The area of wetlands have reduced considerably and that too for nonagricultural activities. A portion is used for vegetables now. The area covered by seasonal crops can still be reconverted to paddy. Vast areas under multiple crop system is now having just one crop. Perennial farm crops dominate farm sector. The agricultural labourers have become rubber tappers and high wage rates have reduced their number of working days creating underemployment through out year. In 1951 23.22 % of working force were cultivators and in 1991 it has declined to 12.24 %. Agricultural labourers constituted 26 % of working force both in 1951 and 1991. All trade unions (INTUC, CITU, AITUC and Karshaka Morcha of BMS) are in favour of lease-in cultivation of fallow land as it increases the number of days of employment and productivity of wetlands in general. The new agrarian relations in Kerala is thus having a radical change from what it had been.

Probably the best article about our status about food sufficiency is reflected in a exhaustive study on India State Hunger Index (Comparison of Hunger across the states .Purnima Menon ,Anil Deolalikar ,Anjor Bhaskar .Washington DC .,Bonn ,and Riverside .International food policy and Research Institute February 2009). Without going into the details of the statistics drawn I will just draw the attention of readers to the Hunger map of India provided by the authors.

In that we find Madhyapradesh has an hunger index 30 % or more that is extremely alarming. Kerala, Andhrapradesh and Assam, Punjab Chandigarh 19.9 which is serious .Kashmere, HP, Utharkhand, Arunachal Pradesh, Tripura, Meghalaya, Nagaland , Manipur

and Mizoram and Goa er index not yet estimated. The rest of India (Haryana, UP, Rajasthan, Delhi, Gujrat, Bihar, Charkhand, West Bengal, Orissa, Maharashtra, Karnataka, Tamil Nad) has 20-29.9 which is alarming.

So only Kerala, Andhrapradesh, Assam, and Punjab Chandigar are less affected areas (it has severe, if not alarming or extremely alarming rates). Why these four areas have less alarming Hunger index?

Because of the plain and simple reason. Kerala, Assam and Andhrapradesh are the major paddy growing areas due to climatic conditions. If these three areas can grow more rice, they can meet the needs of the other states which are not that lucky to have such a good climate and fertility. This we have to remember always. And the National and State programmes should give more importance to Agricultural operations. In Punjab the green revolution is now growing enough wheat and therefore they have also escaped a little from the alarming state of affairs.

See the importance of the Nature's gift for growing rice or wheat, the staple diet of the people. The Civilizations of India from ancient times knew this, and on a co-operative basis had a flourishing agroeconomy which shared foorgains and bartered with other products. This is still possible if we unite, have a common goal for the nation and do not think in individualistic and state-oriented selfish way. We are a single nation and has to remain so. We have to produce food more for the sharing of it with others, and the other operations like dwelling constructions etc can be done only where there is no fields of cultivation.

Moreover, the greenery and nature, the protected heritage sites and opportunities for safe boating and fishing etc can bring more tourism opportunities for the state. If no monuments and no greenery, no natural beauty and wild life which tourist will prefer a state as tourist attraction?

Food is Annam and the earth is Annapoorna, the Holy mother. From Vedic India onwards the significance of food and its role in life had been recognized and well researched by Indians. But in the western world as Peter Atkins and Ian Bowler suggests in the introduction to their book "Food in society" food has received little academic attention due to it's a taken for granted attitude to life, and as a research subject it lacked novelty in

social sciences. Recently the food and its research has become prevalent in historical, cultural, sociological, anthropological and post modern, post structuralist studies. The idea of a food system according to the authors stretch back to 150 years only (page 9) starting from George Dodd's book (1856) to Raison's (1933). They give the estimates of the main components of the UK food system 1997 from the ministry of agriculture and the agrifood system modified after Whatmore 1995 (pp 10-11). The food from farms goes to manufacturers and from them to wholesalers and retailers, and thence to caterers and consumers. The export is about 7 less than the import.

The Agrifood system has the agritechnology industries at the top and the food

consumption at its base.

Agritechnology industries	Machinery Chemicals (fertilizer, pesticides) Biological(breeding ,GMOs)
Factors of production	Capital,credit,financial services,labour market,information,training,supply of seeds,chemicals,equipments
Farming industry	Landed/property interests, Farm business Farm/property servicing agencies
Intermediate	Wholesale assembly Imports/exports Storage and transport industries Co-operative /state collective marketing Policy and intervention arrangements
Food industries	Processing,manufacturing,packaging,wholesale distribution,catering,retailing
Regulation	State health and nutrition policy State food quality Safety monitoring Food security measures
Food consumption	Household labor in food preparation Purchasing power Food habits culture

The food studies are inter-multidisciplinary involving agriculture,geography,ecology ,sociology,anthropology psychology, social administration ,education marketing and media studies and regional cultures and climatology. In human history food is mainly consumed at site of production .The early food gatherers/hunters and the cave dwellers and villagers all depended on their region and climate for food and knew it well for survival. Trade by bartering developed among neighboring societies and it expanded through wandering tribes of the cattle-rearer class and the fisherfolk .By 15th to 17th century India and Europe established a commercial trade and the gain of

knowledge was more for the west than the east regarding agricultural economy and food chains and ecology.The globalization of food and international trading in food started with this at large scale.Production,distribution and consumption of food changed equations with this .Political economy is a branch which helps developing nationally and globally oriented food system along with subsistence agriculture and commercial agriculture for regional as well as international markets. This is a social economy as a way of life founded on food production on a regional basis expanded globally. The concept of food regime developed in the west in 1980 out of French schools of regulation theory.

1 EXTENSIVE REGIME mid 17th to world war 1.

2 INTENSIVE REGIME end of world war 2 to 1970(1947-1970)

3.Regimes since 1980.

Regimes of accumulation existed from 1930 depression to global recession in 1970.It was a stability by mode of social regulation(MSR) by which society organizes and conducts production and reproduction and how social relations were maintained .In this interpretation national regulatory frameworks and state rules are product of class powers. International regulatory structures are created from and are sustained by nations and other transnational entities.

Characteristics of food regimes by Le Heron 1993 (pp 26.Peter Atkins)

Food regime	First (pre-world war 2)	Second(1950-1970)	Transition to 3 rd (1980-1990)
Principal tendencies	Culmination of colonialism Rise of nation-state system	Extension of state to former colonies Transnational restructuring of agriculture by agro-food capitals	Contradictions of productive and consumption trends Disintegration of national agro food capitals
Governing premises	Acceptability of alien rule Propriety of accumulation regime Importance of balancing power Legitimacy of neo-mercantilism Noninterference in others colonial administration	International free markets and enterprises Extra market channels for food distribution Avoidance of starvation Free flow of crop information that is scientific Low priority for national self-reliance National sovereignty Low concern about chronic hunger	Multipolarity of power-US ,EC,Japan Global transmission of adjustments Rise of new protectionism Retreat from distributional issues Restricted flow of technological information Renewed interest in national self-reliance
Main historical features	Centered on European import of wheat and meat from settler	Based on strong state protection Organization of world food economy under US	Crisis in world agricultural trade featuring price instability

	states 1910-1914 Import by settler states of European manufactured goods, labour , capital	hegemony after 1945	, breakdown in multilateral agreements increased competition in export markets limited imposition of structural adjustment policies
Main international policy features	Imperial preference .vertical hierarchical relation	Bretton-woods agreement, GATT, postwar reconstruction Multilateralism Nondiscrimination and Legal approach to regulation US management of international agricultural trade system via agenda setting in international relations Commodity agreement and conventions	Attempts to resolve world agricultural trade issues through GATT Framework
Main national policy features	Assistance for land settlement and infrastructure	Cheap food policies Credit expansion Production control mechanisms Market creation via concessionary export sales and food aid	Opposing trends of further protection and deregulation of agricultural sector

The economic base of the alternative food network have a range of social movements :-

Environment

Sustainable agriculture

Community-supported agriculture

Consumer and health

Genetic resources conservation

Animal rights

Consumer preferences

Farmer's markets

Traditional medicines ethnic cuisine

Variations in farm size in selected European nations (1993) showing % holdings in each farm size groups from 1-5 Ha to more than 50 hectares.(European commission statistics)

Country	1-5 Ha	5-10	10-20	20-50	.>50
Germany	31	15	18	23	13
Greece	75	15	7	2	0.4
Italy	77	11	6	4	2
Spain	57	16	11	8	7
UK	14	12	15	24	33
EU12	58	13	10	11	7

Alternative agriculture (Beus and Dunlap 1998 pp 598-599)

Conventional and alternative agriculture :The paradigmatic roots of the debate

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CONVENTIONAL AGRICULTURE	ALTERNATIVE AGRICULTURE
Centralisation:- 1 .Fewer farms 2.Concentrated resources 3.National /international marketing	Decentralisation:- More farms Dispersed resources Local/regional markets
Individualism:- 1.Self interest 2.Reduced labor 3.Farming as business 4.External costs ignored 5Material success	Community Co-operation Retained labor Farming as a way of life All costs considered Non-material values
Specialization 1.Farming reduced to individual components 2.standardised production	Holism Farming as a system Diversification

The dictum “Grow globally and eat locally “is the reflection of sound economy

The food surplus and shortage in different regions has to be tackled by more production in the deficient regions for local consumption. There is direct relation to population growth and food insufficiency and poverty and hunger.

Abraham (1991 Food and development .The political economy of hunger and the modern diet .London) shows the relation like this.

Patriarchy leads to large families, and high population growth and poverty and hunger. In families with low population growth (and small)wealth accumulates and there is a class divided agrarian system with more surplus food and diet in sufficient calories. He does not say the role of matriarchal system but in India this was the reason for the class divide. The matriarchal small family and the joint family (undivided land)and the co-operative farming of all members of the joint family were undertaken in Kerala till recently. It was only in 1903 the partition deed of the Kurumbatur and Punnayrkulam branches were done (though they existed from 1790 onwards).Both the landed property was looked after by the senior member of the Kurumbatur branch till 1903.(Also see the Nalapat saga for the population control of matriarchal and patriarchal systems)

According to Buringh and Dudal (1987 Agricultural land use in space and time. Q P Atkins)and Alexandros (1995 world agriculture :towards 2010 Chichester :wiley) the cultivated land in South Asia from 1988-1990 in million hectares is 175,and further potential for arable land is 38 and a total is 213 million Ha .For possible more efficiency of food production Smil,V(1994How many people can the earth feed ?Population and development review 20,255 -92)suggests :- Improved field efficiencies with better agronomic practices,higher fertilizer uptake, reduced irrigation waste,reduce waste by post-harvest losses ,and end-use waste, and have healthier diets having limited fat intake to 30 % of total energy and by these means a total gain of 60 % by 2050 is aimed at. Results from regression analysis of determinants of food supply factors in 90 developing countries ,Bongaarta J(1995.Can the human population feed itself ?scientific American 270(3),18-24) takes the supply factor, population density GDP per capita for different regions.

The supply factors are

- 1.Proportion of land cultivated
- 2.cropping frequency
- 3.proportion of area for food crops
- 4.crop yield
- 5.Trade multiplier proportion directly consumed

6. Animal product multiplier

7. Calories per capita per day

In Asia the cropping frequency is less and crop yield is less due to this. Malnutrition, food and famines:- Income and purchasing power, class and geographical peculiarities and lack of awareness of nutritious food are the reasons for malnutrition in varying proportions.

What should we eat and in what quantity and quality? What is a vulnerable group for hunger and malnutrition and what are its causes? How can we combat the problem of hunger and malnutrition in an overpopulated society?

Our requirements vary with age, sex, occupation and several other factors. Undernutrition is an inadequate intake of calories and malnutrition an imbalance of nutrient consumption due to shortage of a key element like a vitamin or mineral like iron etc. Deficiency can also arise due to soil peculiarity and geological factors.

Vulnerability in social space

	Entitlement relations	Power/institutional relations	Social relations/class relations
In social relations	Vulnerability as entitlement problem	Vulnerability as powerlessness	Through appropriation and exploitation
Vulnerable groups	The resource-poor	The powerless	The exploited
Critical regions	Marginal regions	Peripheral/dependent	Crisis-prone regions

Causes of vulnerability:-

Underlying causes :- population growth, surplus production and resource competition, hierarchical appropriation, environmental fluctuations

Immediate causes:- Natural disasters, war, social disruption, entitlement loss

Hunger situations:- regional food shortage, household food poverty, individual food Deprivation

Direct consequences:- economic loss, depopulation, social conflict, impoverishment, family dispersal, migration, limited activity, wasting, stunting diseases and death. Each leads to the other.

The underlying processes lead to the immediate causes. They in turn lead to hunger situation and direct consequences.

IMMEDIATE	HUNGER SITUATIONS	DIRECT CONSEQUENCES
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Natural disaster War Social disruption Entitlement loss	Regional food shortage	Economic loss ,depopulation, social conflicts
Resource poverty Excess tax/rent Entitlement exclusion and failure Ethnic, societal discriminations	Household food poverty	Impoverishment Family dispersal Migration
Disease Special needs Neglect and abuse Gender and age Discriminations	Individual food deprivation	Limited activity Wasting and stunting Disease and death

How do people cope with a famine /

Source of adjustment	Early stage of response	Intermediate	Final stage
Production	Change cropping Planting practices Increase home production		
Labor	In search of employment	In search of employment in face of expected wage rate fall. separation from family	Distress migration
Assets/capita	Sale of small stock (liquid easily reversible)	Sale of production assets(livestock,tools,land) in a depressed market	Separation of families probably permanent
Loans/transfers	Interhousehold transfers and loans	Credit from money lenders	Donation(relief assistance)
consumption	Switch in expenditure/diet composition Reduction of consumption level (cut frequency or size of meal or both) Adjustment in	Reduction of consumption (greater dependence on market)	Reduction of consumption(survival threatened)

	intra-household allocations		
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Food production surplus to domestic demand is an achievement a family/society/nation /world can be proud of. The excess produce can be shared with others. This is needed not only for appeasing hunger but for having a healthy nutritious diet for a healthy society .That can cause cost reduction in the medical field which is in enormous proportions at present. Early warning systems (EWS)of famine by a state Government by climatological observations and proper organization and collection of surplus grain in granaries has to be viewed in this way and then we will understand the Mohenjodaro granary in its proper perspective and the astronomical varshaphala in each village as well. It had been a national surveillance at community level ,the supply-side data, especially on harvest ,storage and marketing and the power of monitoring and coping strategies of an ancient people who had knowledge of their environment ,and geographical features. They did not have satellite remote sensing or automated data analysis but were well informed of their environment and geography and its implications on food and famines and natural disasters. They were well equipped with dealing an emergency situation and had the moral and economic strength for it traditionally.(as we have demonstrated in Indian history chapters).The food security priorities of the NGO forum to world summit (1996) are on strengthening of family farming decentralization of wealth and power, agriculture and food production based on agric-ecological principles .They even suggest the suspension of IMF /World bank structural adjustment programmes,more participation of peoples programmes and food sovereignty take precedence over macroeconomic policies and trade liberalizations. Hunger and poverty and malnutrition are fundamental questions of justice. The right of every one to life should come before the profit motive is the message.(pp 171 Peter Atkins)

Food and health:- A high cereal diet ,with lots of vegetables and fruits lower heart disease ,cancer and a variety of other diseases. Reduced alcohol and tobacco use with lot of fibers in diet prevent cancers of different types. Antioxidant quality of fruits and vegetables having vit A,C and E neutralize the degrading effects of free radicals on cellular DNA reducing cancer risk.Grapes,tomatoes,garlic ,cruciferous vegetables like broccoli and cauliflower,fish oil,soya,turmeric and carrots have anticancer properties and are called functional foods.Upto 80 % bowel and breast cancer can be preventable by diet change. Red meat and processed food without fibres increase risk of cancer.committee of medical aspects of food policy(COMA) of UK recommended cereals ,fruits and vegetables to be more in

diet.(1984).Low income and dietary health links:-When purchasing power is high people neglects agriculture and depend upon purchasing food with high costs. And they go for fast foods and high meat ,fibreless diet and become unhealthy. The low income people depend upon the regional foods available and if that is not produced in enough quantities they become malnourished.The low consumption of fruits and vegetables
Less food rich in vegetable fiber
Low intake of antioxidant ,vitamin and mineral rich foods
Reduced growth rates in utero

High rates of female obesity
Low incidence of breast feeding
Maternal smoking during pregnancy
High salt intake of mother and hypertension
High alcohol related morbidity
Dental decay
Kwashiorkor and related diseases
Anemia

These are directly related to infant and child health in society. Social exclusion of certain fruits by poverty and lack of purchasing power and unavailability of nourishing food and also lack of awareness of what to eat to be well nourished are factors to be dealt with for a healthy community living. Industrial food processing and additives for preservation are other reasons for unhealthy food. The traditional food processing systems of India and the simple diet was free from these (See the interviews with the people of Punnayurkulam). The agrichemicals like insecticides, rodenticides, herbicides, fungicides are causing concern since they appear in the food. The side effects of drugs used to increase growth of plants is yet another problem. These are manmade problems and is of short history. The traditional remedies for the pest control, manure, and preservation are safer.

The green revolution was the result of an intense plant breeding programme that relied upon applied science and luck. It was green and related to food and plants while that of revolution was red related to bloodshed. The HYV of wheat and rice from Mexico and Philippines was used for it. In 1943 Rockefeller foundation started the research on new local variety of wheat in Mexico. In 1966 the research institute International rice research institute was founded in Philippines (IRRI) with financial backing of Rockefeller and Ford foundation. They collected rice from all over the world, kept them in seed bank for possible future research and breeding. In 1966 the miracle rice IR 8 was released. It was a crossbreed between Petan, a tall vigorous Indonesian variety and Dee-geo-woo-gen, a short stiff strawed Chinese rice. The new variant showed some desirable characters. By 1981, 500 semi dwarf varieties came and 150 were from IRRI. IR 64 in 1985 was one of the most successful one with high yields and resistant to pests and diseases. HYVs now have taken over the traditional varieties (TVs) globally by now.

Phase 1 of Green revolution was one of euphoria in the 1960s. The defect with TVs was that the farmers could not store them for long times for future use. HYVs demanded more work (10-40 % more per Ha for wheat and 30-60 % more for rice). This was for weeding, pest control fertilizer application and moisture control. Consumers also benefited by low price. The small holders of farms could grow more in a small plot and devote the rest of the area for cash crops.

Phase 2 by early 1970s. Poor became poorer and there was a negative phase. Green revolution in theory was to help all but in practice it could not do that and the rich

became richer widening the gap. Rice is host to 150 diseases and pests. TVs developed for centuries of trial and error experience was immune to many of them but HYVs were not. In 1970 and 80s the brown leaf grasshopper that carry the grassy stunt virus caused widespread damage to IR8 in Indonesia and other countries. More pesticides had to be used. Negative impacts on soil occurred. Small farmers could not cope with the loss and the cost of agriculture.

In areas of floods like Bangladesh a long-stemmed and floating varieties were used (refer to the pokkali mentioned by farmers of Punnayurkulam) because the people knew the nature of their locality. Shortstrawed HYV cannot be grown there. Modernisation with tractor was an inbuilt threat for the poor. They improve the timeliness of ploughing and harvesting operations. But displaced the laborers and left them unemployed and small holders could not do this operation without pooling with larger farmers who has lumpy investments. In India the irrigated areas of Punjab was well suited for HYV of wheat and Tamil nadu for HYV of rice. Their success in green revolution caused rural disparities of wealth in India. The less favored areas suffered price cuts and this was corrected by self migration of people to the areas of green revolution. (pp 224 Peter Atkins)

Phase 3 Late 1970-80. Small farmers were adapting to the HYVs and they could afford the high expensive input of chemicals and fertilizers. More research and more investment and food availability was replaced by the concept of entitlement of poor farmers and to environmental variations and socioeconomic contexts. HYV was labor-intensive and appropriate for the densely populated south Asia and inappropriate for Africa where there is a rural labor shortage.

Phase 4 1980-90s. There was a realization that the traditional breeding methods which had been the basic underpinning of the green revolution was nearing their ceiling for increased production. Yield growth slowed in Punjab due to ground water exhaustion, micronutrient depletion, built up of pests, conventional plant breeding was unable to find the answers. Tissue culture and embryo transfers had to be done to keep the races of plants and animals. The natural was replaced by artificial. Green revolution shifted to gene revolution.

The spatial typology of the green revolution

Type 1. Leading innovative regions with rain fed well irrigated fields for poverty alleviation.
Type 2. Backward areas poor or exhausted soil, few water resource, dry or cold climate. For forestry and non-farm rural development
Type 3. Second generation breakthrough areas, in crops like Kharraf sorghum in Maharashtra, ragi in Karnataka, Maize in Malawi, Zimbabwe, rice in west Africa for small farmers as an experiment
Type 4. Reasonably favored areas not suited for HYVs and where farmers had switched of to cash crops that were abandoned in type 1 areas. Like pulses and fodder. In Gujarat from wheat to mustard, rapeseed and groundnuts and in North Arcot from rice to groundnuts and sugar.

The key components of biotechnology

Genomics. Mapping the genetic make up of living things
Bioinformatics. Assembly of genome data into accessible forms
Transformation. Insertion of new genes with useful traits
Molecular breeding. Identification and evaluation of desirable genetic traits in breeding programmes
Diagnostics. Identification of pathogens using molecular characterization
Vaccines. Development of recombinant technology DNA vaccines to control disease

Biotechnological applications in agriculture

CROP IMPROVEMENT	LIVESTOCK IMPROVEMENT
Protoplast fusion and somatic hybridization to produce new breeds Disease free plant propagation Production of genetic maps Biological nitrogen fixation Genetically engineered male sterility ,to produce hybrids Transgenic plants for pest resistance In vitro germ plasma conservation ,storage and distribution	Production of growth hormones using engineered bacteria Embryo manipulation to introduce traits Transgenic animals for better feed efficiency New vaccines Disease diagnosis

The threat to diversity of cultivated plants by using a single variety in vast areas by a monoculture is there. There had been 95 % loss of farm level biodiversity in the 20th century alone. It seems essential to protect the vast variety of genes in traditional agriculture in the less developed countries as well as in wild plants.

The five freedoms :-

- 1.Freedom from thirst,hunger,malnutrition.Easy access to clean and fresh water in adequate amounts and nutritious food for all living things
- 2.Freedom from discomfort. Environment suitable to their species, including adequate shelter and comfortable rest area.
- 3.Freedom from pain ,injury ,disease. By prevention, rapid or early diagnosis and

Treatment

- 4.Freedom to express normal behaviour.By provision of sufficient space ,proper facilities, and company of its own kind
- 5.Freedom from fear and distress .By ensuring that living conditions avoid mental suffering.

The discussion from animal welfare naturally leads to animal rights and increasing trends to vegetarianism. Singer (1998) reported that in next few years vegetarianism will prevail and meat eating will be abandoned as tobacco smoking. The principal motives for vegetarianism on the increase are the moral/spiritual, health reasons, ecological, taste reasons. In India once a predominantly vegetarian nation, with occasional meat in diet there is an increasing trend in nonvegetarian food after the western rule and by the 1970's only Punjab, Rajasthan and Gujarat has more than 60 % vegetarians in rural/urban settings. In Kerala 29 % rural and only 10 % urban people are vegetarians at present and this trend shows though considered most literate Kerala people are not aware of the new trends in the west concerning vegetarian food and its acceptability over nonvegetarian due to several reasons –both ecological, moral and health related.

Factors affecting our food choice:-

1. Geoenvironmental. The agroecosystems, time of day, season, regionality of food culture, spatiotemporal and hierarchical diffusion of food habits
2. Socioeconomic: Religions, taboo, social customs, ethnicity, income, social class, household composition, knowledge of nutrition, attitude to food related health risk, advertising mass communications, travel, retail system, moral values
3. Physiological. Heredity, allergy, therapeutic diets, taste, accessibility, sex, body size, age

Classification of different types of eating:

1. A meal:- structured event, a social occasion, when food is eaten according to certain rules
 2. Snack. Unstructured food event without rules of combination or sequence
- Types of meal:

- 1 Major meal/main meal. First course of cereals (CH) the central course of vegetables of different types prepared in different way (culinary science) with gravy, dhals and pulses and also curd/butter etc.. Finally a sweet. (may have fish, eggs or meat for nonvegetarians)
2. A minor or secondary meal. Eg Breakfast
3. Less significant meal. Eg tea and biscuits.

A complete meal is that which contains all nutrients like CH, Fats and Proteins and vitamins and minerals. If protein, CH and fats present but no vitamins or minerals it is an incomplete meal. If there is protein, fat and vitamins and minerals but no starch, plant proteins and dietary fibres it is a less balanced meal. The food without animal protein and fat is a vegetarian meal.

Apple is a high quality snack. Apple and a chocolate makes a mixed quality snack and chocolate alone is a low quality snack.

Daily pattern of meal intake in sample of American adolescents (1989-91)

1. Three meals with or without snacks 58.4 %
2. Breakfast, lunch with or without snacks 5.5
3. lunch, dinner with or without snacks 13.4
4. Breakfast and dinner with or without snacks 14.4
5. One meal and snack 5.4
6. One meal and snack 2.9

(compare with Punneyurkulam interviews and the food of local people as told by William Logan)

Dietary pattern and food including proper nutrients is a culinary science closely followed and researched by the Indian women of antiquity to this day. This depends on the female household head and her knowledge, freedom and skills in processing and cooking etc, gardening and making fruits and vegetables in her gardens.

Agricultural decision making was as much of a woman's area as it was that of man since she was also participant of rice and vegetable growing and knew all aspects of cultivation, season etc and this gave lot of freedom for agrarian women than their modern counterparts of India. They had access to irrigation, spring water, rivers, land, cow and cattle, sheep, goats and other domestic animals, poultry, horticulture crop produce, trees and

credit systems, agricultural labour, team work and farm inputs and the monetary benefits there from. This was so in Ethiopia and Tanzania surveys of 1998 by FAO. The effect of combined income of man and woman in the household had several positive effects in society as a family productive unit of agriculture. This also was found the same in other regions like Kenya, Taiwan, Guatemala, Brazil etc. The household calorie level, expenditure on food, child welfare, and child survival depends on the share of woman have in the total family income and her decisions in family matters of food and health and population control and agricultural decisions of production for sustenance of family.

The sex ratio of India (1901-91)

1991 census show 407 million girls and women and 439 million boys and men .For every 1000 men 927 women. This is called the sex ratio. India is having the lowest proportion of women population in the world today. The sex ratio is falling gradually from 1901.

1901	972
1911	964
1921	955
1931	950
1941	945
1951	946
1961	941
1971	930
1981	934
1991	927

Haryana (865 as ratio) has the lowest ratio in the world ,succeeded by parts of Gujrat,North western Madhyapradesh,border districts of Rajasthan, and western Uthar Pradesh .Kerala has a better sex ratio. The central role of women in the food chain is now receiving more attention by the academicians .The matriarchal pattern of society and its agrarian joint family system needs to be studied in this light and not under the western nuclear family concept .For co-operative farming and for labor needed for various agrarian operations, joint family and joint communes or society and common land holdings are more suitable .It increase productivity ,and production by common co-operative work which is cost-effective in itself.

The aim of any community development project and National Extension science is to Provide nutritious food,clothing ,shelter,health by clean water and environment,free education for all ,but along with these basic materialistic needs a change in the outlook of the citizens and rulers for development of the full potential of human resources and a unified co-operative effort to develop the nation and its environment and in the long run ,that of the entire world.Unless this is not achieved,the goal of welfare state with equal opportunities for all citizens will never be achieved.The process of transformation in the socioeconomic life of villages leading to growth –economic,manpower resources –for

rejuvenatation and revitalization of nation.

1 Elimination of poverty ,disease and ignorance is in other words socioeconomic growth,Perfect physical,mental and intellectual health ,and educating every citizen .

2.To infuse spirit of brotherhood and co-operation is equivalent to instill the spirit of Humanity and spirit of a unified nation and that is Indianness for an Indian.Not based on any other factor like caste,creed,language ,religion or political affiliations etc.

3. Seeking self-help is learning self-reliance

4. Sufficient scientific knowledge has to be taken to the most distant neighbour's door – that is to the most distant village – and for that one needs knowledge and communication skills and a spirit of unity and co-operation and compassion for all.

For these to be achieved we need the Triple tenets.

1. The Faith in ourselves

That we can Do it

We can Train to do it.

We can Create conditions to achieve it

2. Triple character of Rights

To Live

To learn

To do duties

3. Rules of business

Elevate

Integrate

Standardize

Nature and ecology of the East:-

There are two schools of thought about history of east and its ecology called 1. Golden Ageists and subalternists & 2. statistical/empiricists. Though their ideology and methods of study differ, somewhere I find these two views having a convergent point. The integration of the third method known as Oxford tradition gives a better understanding of the entire state of affairs.

I had been a practicing Pathologist throughout my life. I had done some research on children with Leukemia in 1977 onwards and on many other types of cancers and on role of environment and food on cancer epidemiology and when there was an environmental pollution in Chaliar near Medical college Hospital where I was practicing, I went into details of environmental pollution, food insufficiency and disease relationships.

The fact remains that the doctors of East India Company Medical service in 19th century made the first revolutionary change in the consciousness of ecology of Europe cannot be forgotten. The fact that the cyclical action and reaction of deforestation, lack of rain, lack of food grain, famine, disease and nutritional deficiency that lead them to this. In Oxford dictionary the environment is “That which environs; especially those conditions or

influences under which any person or thing lives or is developed". Southern Karnataka and Kerala had human inhabitations on granite hills in Neolithic times before BC 3000 (pp 48 Nature and Orient) and they did Punam krishi and protected cattle (Bos indicas) and mined gold, and exported gold, cattle, timber and other forest produce. From 6000 BC to 300 BC they continued this activity but not much destruction of races or environment happened.

In 326 BC when Alexander came Punjab was dense forests (Spate & Learmonth ch 2 . George Erdosy. Nature and orient pp 51). In AD 11th century when Gazani Mohammad came, Yamuna and her banks were full of trees. Till 19th century entire Ganga banks were forests. The first tree for railway was cut from bank of Ganga.

Indian Ecology in Foreigners eyes:-

Herodotus heard of India from Persians and wrote that India has giant ants that do mining of gold and giant foxes etc. (Was the Persian accounts about ancient Dinosaurs?) In Mahabharata (2.48.4) it is said that tax of gold upto an ant (pipeelika) to be given. Probably this saying had traveled to Persia and to Greece. Herodotus says that the earth's end is blessed by nature and is fertile. He wrote: "In India, which, as I observed lately, is the furthest region of the inhabited world towards the east, all the four-footed beasts and the birds are very much bigger than those found elsewhere, except only the horses". He said Indians respect beasts and plants and will not destroy their life. This protection of nature and ecology was the hallmark of India. In 509 BC the Captain of Darius Skylax of Karianda came to Indus river and wrote about the plants there: But what he wrote is not available now. One sentence quoted as his is: - On either side of Sindhu is high mountains in them there are evergreen forests. And several thorny Kunara (Wild roses called Kunosbatos according to Theophrastus.) After 80 yrs of death of Socrates, Aristoxanes speaks of an Indian sanyasin who saw Socrates and talked with him. What they talked is unknown. Since Socrates was not interested in ecology it must be philosophy. In 416 BC in the durbar of Darius 2nd under Artaxerxes was the vaidya Tessias of Nidos. He hadn't come to India but had written "Indica" from whatever was heard from Persia. This book also is lost but Aristotle quotes from it several times. For a vaidya the plants as medicines in India was a subject interesting. The Indian spices being famous in the west as medicines the physician was justified in writing such a book. One cannot say that Indica is a scientific text with misunderstandings like the carnivorous man-eating tigers as having three rows of teeth, and a tail like that of a scorpion etc.

In the group that accompanied Alexander, disciple of Aristotle, were Ptolemy, Aristobulus, Niarkkes, Kalisthenes. But we do not have any of their books. Yet the books of those who studied them and wrote of them is available. They are Deoderous, Strabo, Plutarch, Curtius, Arrian etc. They had given something about India's plant and animal life (only upto Sindhu river).

Deoderous wrote that India is a beautiful landscape with mountains on which different varieties of trees and plants grow and fertile expanses of fields are abundant and several rivers are present. Since water scarcity is not there majority of the areas have two harvests a year (Irappoo in our language) and all sorts of fauna exist. The rain comes in a wonderful cycle which never fails. Therefore farming activities are according to that. Even in hot seasons from the hot atmosphere they get rain. By the heat, the tall grass in marshes have good roots and grow well so that cattle get good feed.

Philostratus wrote:-When Appolonius the philosopher went to visit Sindhudesa from Theana,he saw a big elephant called Ayya's which was taken from king Porus by Alexander. Among the scientists and philosophers who accompanied Alexander ,Kallesthenes ,nephew of Aristotle died before he reached India and could not see the dream country of his uncle. Others collected as many plants ,animals, information about them, and as many granthas as possible and records on history and science etc.About this we have an account of Pliny,the elder. He wrote that Alexander had a desire to know about nature and animals. Aristotle his Guru was the reason behind this. Everyone in Asia and Greece who were living on agriculture,hunting,fishing etc were asked to give as many information possible to the men who accompanied the conqueror. From their information, and collected samples Aristotle wrote his 50 volume treatise. In the "Lycium"which is the Aristotelian school ,specimens(both dead and alive)and grantha and manuscripts reached from India .The philosophers and scientists who made use of these and became scholars are known as Peripatetic philosophers. Greece knew about cotton,banyan,grains and bamboo etc from these wandering philosophers who accompanied Alexander.Elephant,snakes,monkeys of different varieties ,lion,tiger,parrots,crocodile,strong ferocious dogs of India were wonderful articles for them.Nearcus said we wanted to see the big ants which do gold mining and a clever businessman showed us the skin of a leopard and told us this is the skin of that ant. Alexander himself asked a sage which is the cleverest animal in the world and he replied that "That animal which man has not yet seen is the cleverest animal" and this is written by Plutarch. The wandering scientist/philosophers /army of Alexander wrote in 4th century BC that it is the forests which give homes,fuel,vehicles,forest goods for daily and export use,defence and hiding places and their ships are strong because of these forest trees.They wrote we have seen only the coastal fringes and beyond and far off are the real tall trees and the peaks of the mountains with dark shades.Deoderus said the wood for Alexander's ships were brought from those far of forests which they had not seen.Strabo thought this may be in the Himalayan areas. To send Nearchus to Gulf of Persia from Sindhu river, a timber town near Sindhu(Xylinepolis)gave timber for ship making and it was from there the journey began. The army cut trees from banks of rivers for fuel and for campfires at night. Before the battle with Porus,Alexander rested in a island in Hydaspes river which was full of tall trees.

About warfare of Indians Arrian wrote:-They will never destroy the fertile nature or forest or fields of even the enemy.He expresses wonder that they never kill the agriculturists and farming community either.His words were:-"If there is internal war among the Indians ,it is not lawful for them to touch these landworkers ,nor even to devastate the land itself" The same opinion is expressed by the Jesuits about the warfare of the Koraga in South India (and of Pazhassiraja's troupe)in 15th and 16th century.So,the unity and continuity of a people is not a fleeting one. For 2000 years both kings and peasants alike knowing the dharma of protecting civilians and nature, the ecological balance of the nation by themselves ,without any pressurization from outside law ,is commendable. Such a dharmic,scientific,administrative and statecraft ,based on ecology and ethics and on a centralized and decentralized Republican way is not seen for such a continuous period without coercion in any other part of the world .

Nysa and the Meru:-

When the Macedonian army crossed Hindukush they saw a land with lot of plants. They saw Ivy which resembles the plant in Greece, grapevines, Berrys, Laurels, Myrtles, Box etc there. In the Mediterranean the ivy and grapevine is related to worship of Dionysius cult. So they thought they had reached the earthly heaven which their mythical God is said to have visited. In one place the people told them that this is called Nysa. The word meaning of Dionysius is God of Nysa and they thought the name of their God is originated from this land. The locals said, this is a small part of Mount Sumeru and is supposed to be the Devabhoomi. Immediately they thought that the word Meru has a similarity to the word for Thigh in Greek language and since Dionysius is born from the thigh of Zeus (as Vaisya from that of Vishnu) the cult must have originated in India, in this place. Thus happy with finding out their origin the Greeks drank wine and wore laurels of ivy and danced on the mountain top. This had been repeated in several independent sources and seems correct according to J. Donald Hughes (pp 76 ch 3 .Nature and Orient). Thus from India, the biology, ecology, agricultural science etc were transported from India to Greece through disciples of Aristotle who accompanied Alexander. India gave answers to Aristotle on specific questions like 1. How a life form originates. 2. How does it grow. 3. How does it function. 4. How in a specific locality many forms of life live together without any race being destroyed. 4. What is the relationship between life forms and nonliving forms of dravya in nature. Aristotle wrote that in "Metaphysics" as follows:- "All things are ordered together somehow, but not all alike, including fishes and fowls, and plants. And the world is not such that one thing has nothing to do with another but they are connected". Thus oneness of nature and ecology reached Greece from India.

1. The food habits of different people
2. The food chain
3. How in the competition for life Jeevo jeevasya jeevana happens
4. The role of Veeryadharana for progeny and its strength
5. Reproductive capacity
6. When the race of prey ends the race of predator also ends
7. Local, regional peculiarities of ecology due to Geography and climate
8. The way of Paraada or parasitism
9. The importance of Symbiosis as a co-operative society
10. How the races and species of each locality adapt themselves to that particular environment
11. How are some aquatic and others terrestrial

These questions and classifications and explanations and lifestyles have influenced Aristotle from Indian medical texts and the Shaddarsana.

He asked. Why elephant though it can swim in water is not an aquatic animal? Why the small variety of fish in South India though they jump and live on land are not terrestrial life? (About Psedapocrytus, Anabas)

How man's interference in nature has affected it? (agriculture, domestication including)

He understood from India that the wild (growing on its own in forests, mountains) and tame (domesticated and living in village and towns) are present in plants, animals, birds and in men alike. The wild survive if left alone.

Indians gave him an explanation for the ferociousness and strength of their dogs used for hunting. They said it is a crossbred of Kurunari (jackal/wolf) and dog. Greeks thought that kurunari was a tiger. And they debated over this for years. Then Aristotle came up with a

solution. He wrote:-“Indian dogs spring from the union of a dog with some wild dog-like animal”. In Ramayana it is said that the dogs of Kekaya ,of Prince Bharatha ,has dogs with strength of a tiger. This also was one reason for the confusion of the Greek.(The real reason was that they did not know how to crossbreed or principles of domestication and creating a strong progeny).When discussing Indian species Aristotle was more careful about their structure and Taxonomy like the Medical texts of ancient India. About ecology and crossbreeds he wrote from second hand reports.

Theophrastus of Eryssus:-He was disciple of Aristotle who continued the study .Aristotle was mainly concerned with animals while Theophrastus was concerned with plants. He studied plant life mainly in the context of environment. His theory of ecology was:-

“Mutation according to the place ,adaptation to the environment

,competition,symbiosis,role of environment in plant diseases ,effects of cultivation and acclimatization ,anthropogenic changes in climate” and was more scientific. Each plant should have its specific land and environment (Oikeios topos,oikeia chora).This is what the modern ecologists call a niche .Oikos means a home, a habitat, or a domicile. From this word originated Ecology .In Sanskrit an Oka is the Habitat or home .oikos from Oka,and Ecology from Oikos is the literary ,etymological derivation of the word.

Some need dry climate ,others need lot of water, some need more sunlight ,some need shade ,some need mountains and others marshes. In this way ,if all these diversities of nature exists in a country, naturally the country will have more biodiversity. All species of plants, animals and men are possible in such a landmass. The local people of Nysa had told the Greek that Ivy grow only there in India. In Ramayana it is said the four plants Suvarnakarani,Visalyakarani,Santhanakarani and Mrithasanjeevani grow only in Himalaya, in Sumeru peak. As an explanation for this Theophrastus wrote:- India shows differences ,in that part of it bears certain things which another part does not. Thus the mountainous country has the vine and olive and the other parts the fruit trees.”.

Theophrastus describes the Mangrove forests of India which was given by people who accompanied Alexander. He mentions this ecological society of plant life, the tides, periodical salinity by floods, and its relationship, and the special type of growth of roots of mangrove forests etc.he understood the ecology of it but could not differentiate the different species in it. The first scientist(Botanist)in European language to write on mangrove forest is Theophrastus.He wrote about salinity by tidal waves from Greece where it is never experienced ,by collecting material from the Indian-returned people .He tried to point out the environment needed for each plant that he got from India ,though he could not name each. he described 25 Indian plants in this way. Greeks call bamboo as the Indian reed and Theophrastus wrote that it grows in banks of river

Acesines(Asikni).Just like the other Greeks before him ,he too express wonder “How does a grass grow so big?”. His generalization of the smallness of the fruit of Indian banyan(fig tree)was not scientific. He thought that all big trees produce small fruits and there is a ratio between size of tree and its fruit. Banyan which is spreading in acres of land, giving shade for big assemblies to sit under it ,produce roots from branches was a wonder for the foreigners. In old Indian literature a saying that the

Vizhuthu(branch)growing and destroying thaythadi(main stem)is seen. This is the epiphytic nature of the Vizhuthu and the symbiotic existence of the stem and branches .Aristotle and Theophrastus understood this. They understood that this nature is only for Indian species and not for the Mediterranean species. After Theophrastus ,all the Greek

writers quoted him and never had been such an ecological enquirer with originality in Greek literature before or after him. No one continued that tradition of research.

Megasthenes:- (BC 300) Was an Ionian who visited as ambassador in ChandraGuptha's court places which Alexander had not visited. His writings are known as "Indica". Parts of it is quoted by Arrian. The importance is given not to science but for the things of wonder, and myths etc. Chandraguptha had given hundreds of elephants to Seleucus and they had participated in the wars of kings and successors of Alexander in Greece. The embassy of Asoka transferred wealth, knowledge and civilization and science and arts to Seleukid, Ptolemy dynasties. In 279 BC we find the procession of Ptolemy 2 of Philadelphius, participated by several Indians. These Indians were people who were given by Chandraguptha as Angarakshaka and they had stayed back in Alexandria as faithful bodyguards. They with their 26 varieties of cattle, 100 elephants with gold bedecked decorations, and buffaloes, horned deer, lions, hunting dogs, parrots, peacocks, pheasants participated in this procession to commemorate the annual memory of Ptolemy 1, who had brought them from India. Ptolemy 1 and 2 created and nurtured the Alexandrian museum which was a research institute for study of Aristotle and Theophrastus and his disciples Demetrius of Phalerath and Starto of Lampsackus taught there. Just as in Lycium here also a garden with Indian plants, animals and birds was kept for study. Eudoxus of Cyzicus traveled along coast of India in 120BC in a ship. After 20 years, (100BC) we find that Hippalaus, officer of Ptolemy wrote that to cross ocean and reach India one has to depend upon Monsoon winds. Hippos in Greek means the horse. The Aswins in India are the first to control winds and cross the sea in a ship. This Hippalaus is the name of the winds of the Indian ocean as Aswins. And Hippalos and Aswa being horse, this is nothing but a heresay and no such person as Hippalaus was there. In 21 BC Augustus Caesar was welcomed by a procession which included Indians with their tigers and tortoises and a python. In South Asia after this period we find Roman coins. Not before that. The coming of St Thomas to Kerala coincide with the period.

Then the voyages of the west to east must have increased after Hippalas if, such a person has identified the monsoons and known the method to cross the sea. But we find none of it till Vas co da Gamas time. So that, simply means the Greek and Romans had no knowledge of sea travel or of the secrets of it. The knowledge of Indian plants, animals, Indian astronomy (scientific) by which the sea travel is possible is not seen in Greece of that period. They were trying to know it but often fell short of the real knowledge and went on quoting others instead of doing original work out of experience. For it the west had to wait till Vas co da gama's arrival. But, the quotations of the wonder trips and exotic news of India helped to preserve the nature of the west and the east to seekers like us to know the truth.

Strabo's book on geography of world has a long chapter on India. He viewed environment as Deoderus did. Eratosthenes in Alexandrian museum was studying the botanical geography, climatology and observational methods of meteorology of India. He and Aristobulus who accompanied Alexander were sources for Strabo and Deoderus. Strabo describes Indian monsoon and geographical features in a general way. By the water content of atmosphere and the nutrients, the plants grow luxuriously in India

and the reason for big size of animals in India is this as well as the nature of the rainwater India gets.

Pliny's natural history also speaks of Indian fauna and flora. He quotes from Theophrastus but discarding portions on ecology. Whatever Theophrastus said of banyan, jackfruits, mango, Ebony (Veetti), pistachio nuts, Cotton, barley, wheat, olive Mangrove, bamboo he quotes.

Claudius Aelinius commonly called Aelian wrote about animals of India codifying all that was said about them before him (On animals). It is a codified stories of animals of India, with lac insect that makes a precious dye, Kartazonos (Kandamriga or rhino), python that can bind an elephant, the giant monkeys in Himalaya which Alexander saw (The first mention of Yeti) are in this book. The upavana grown by chieftains, and the vana or natural forests, and nature of human ecology are spoken of. He says the upavana are garden forests looked after carefully by the state and the people and they excel even the so-called heavens of Persian kings. Animals, birds and plants grow in natural surroundings and protectors or special guards are there. Among the forests one can see beautifully placed wooden architecture, the skill of the carpenters. They grow trees of India. If at all a species from a foreign land is brought, they bring it after careful study and analysis only (means they knew the dangers of such imbalance of ecology). Both domesticated and wild birds and animals freely grow and nest there. Several nests are on treetops. Lakes are abundant among vegetations. In them large and small varieties of fish grow. No one kills or hunts these animals, birds or destroy the forests. The only time when hunting is allowed is for the princes during their training period to learn hunting. At no other period, and by no other person hunting is allowed. Donald Hughes writes (Dept of history, Uty of Denver, Colorado): - "Data from India stimulated the Greek thinkers to ponder ecological questions more thoroughly and to develop biological analysis".

Till 18th century Malabar and East Indonesia were the only regions where Grampoo was grown. In 1700 BC remains of Terqua in Mediterranean the remnants of imported grampoo was excavated. Rome, Greece and Persia imported it from India as medicine. Nutmeg and gramboo as cash crops became important in Indonesia only after 15th century (Tom Pires) but in India it was not so. The sappan tree, agar, chandan, cinnamon, karpura or camphor, benzoin, frankincense, ommar, gums and resins from forest trees, lac from lac insects, horns of Rhino and elephant, birds and bird nests, tortoise shell, pearls and corals, conches were exported but without destroying the species and without affecting the ecology (because it was done by ADIVASI who knew the forest should last for their existence and their chieftains equally conscious of the symbiosis). Food grains from India reached all other places. Pepper was a cash crop in India from ancient times. The first instance of it being mentioned as a cash crop in South East Asia is that of Chou Jukwa in 13th century. Till 15th century all global markets including China got pepper from Malabar alone. Before 15th century cotton and pepper as cash crops did not exist in South East Asia. In 1400 the sea trade of nutmeg and pepper increased to Mediterranean ports of Europe. (Yearly 30 Town Grampoo and 10 Tonne nutmeg). It is after that the South East Asian markets became prominent.

Traditional pepper farming is done in land which is sloping so that water does not remain there. Sand and clay should be there and tree for climbing should be at hand. The land is usually near the port from where it is exported. The method is to burn the adikkad in the first year and sow dry rice. Bamboo or betel nut for the vine to climb up will be there. The

vine will start giving fruit from 3rd year and in 7th to 10th year maximum fruits are given. The lifespan is 20 years. Therefore by the 10th year itself the new plants will be grown. The old garden is not used for that. Allow the old garden to grow grass or a new forest. According to the export of one year, the farmers plan their area of cultivation. In South East Asia for cash crop cultivation of pepper from 17th to 19th centuries lot of forests were destroyed.

Here we shall compare the agriculture of Sathingpra in South East Asia from 4th to 13th century with Indians.

4-6th century was preurban in Sathingpra and 4000 Ha had irrigation and 15200 had no irrigation. Total hectares cultivated was 19200 Ha.

In Urban phase 1 (6th-9th century) it became 20000, & 30000 respectively with total 50000Ha

In urban phase 2, increased to 60000 and 70000 with total 130000Ha(9-13th)

Phase 3 (13-14th) it was decreased to 10000-27000 with only a total of 37000 Ha.

In these phases, produce with a single pool was calculated in land with and without irrigation.

Preurban:- 5400000 KG with irrigation and 10640000 Kg with rainwater alone = total 16040000Kg

Urban 1:- 27000000 with irrigation, 21000000 with rain alone and total 48000000Kg

Phases 2:- 81000000 with irrigation, 49000000 with rain alone, and total 130000000Kg

Phase 3 had 13500000 with irrigation, 21700000 without, and total 35200000 Kg

In iruppoo (two seasons of produce):- it was same in preurban phase and urban 1 phase. In urban phase 2 a total of 202000000Ha and in phase 3 total of 44400000 kg produced. Supposing the annual need of a family with 5-6 members is 1400 Kg rice finding out the population of the region (both farmers and nonfarmers) the surplus grain produced in the area can be calculated. The storage or sambharana of grain depend upon that. This was the method followed in India for time immemorial. The seed sown, the produce obtained and its ratio even without irrigation is 1:15 and it is increased with irrigation to 1:30-1:40. This is 15 to 20 times more than the temperate countries (Rome 1:4, France 1:6, Burgandy 1:10) and the tropical Asian countries and their prosperity depends upon this and this alone. In this no one can beat us because the nature has blessed us and it is our duty to protect it and make maximum out of it.

Table showing surplus made by SEAsia (pp174-75 nature and orient ch 6):-

Century	4-6 th (preurban)	Urban 1(6-9)	2(9-13)	3(13-14)
Ha(land)	19200	50000	130000	37000
No of farmer family	4266	11111	288888	8222
Nonagri.Fam	6641	21764	60254	21378
No:/fam mem upper limit	10907	32857	180703	48000000
Upper limit of persons	59988	180703	490281	162800

Grain(Kg)total	160400000	48000000	202000000	44400000
Consumed(Kg)	5973333	15555400	40443200	11510800
Annual seed reserve(Kg)	768000	2000000	10400000	2960000
Surplus(kg)	9298667	30444600	151156800	29929200

From the preurban phase to phase 4 urban we find a definite pattern. The land increase till urban 2 phase(9th to 13th century and is a sharp fall after that.)

Number of farmer families increase in the 1st and 2nd phase of urbanization, and a drastic fall is seen in the 3rd phase of urbanization. The nonfarmers increase steadily and their fall in number in 3rd urban phase is not so drastic as the farmers. Total population increase steadily and is highest in the 3rd urban phase.

The total production of grain :-

There is a drastic fall in production when the preurban changes to urban 1st phase of about 112400000 Kgs .Then from 1st urban to 2nd urban there is a increase of 154000000 Kg .The fall in production from 2nd to 3rd urban phase is drastic about 167600000 kg .With all these defects still the ratio of seed: produce is still high in tropical countries than nontropical countries. It is this strength of our nature and ecology that we should be conscious of and the ancient ways of protecting the ecology to be learned from our ancient scriptures. The modern historians who write the history of India saying that there are only petty principalities and chieftains and their quarrels in history of India had totally forgotten this economic agrarian system and its wide network which can never exist without a strong centralized administration and several regionalized agro economies due to diverse geographic features. Each region had its strengths and each shared them with the neighbors by a wide network of local markets and the rest went to the world economical markets .Even now we can do that because we have the potential for it by our position in the monsoon path, in the path of the rain Gods mercy. One has to see the Unhistorical history of Asia of Hegel and Asiatic modes of production of Marx only under this light. Wisdom to protect nature and dharma of nature comes from experience only for a people which withstood millennia of changes .The evolution of such a people is the dharma which they followed and the timely changes for maximum benefit of the people was their revolution .This ecological and historical agro economical evolution and revolutions of India has to be studied well to make us a strong agro economy again. When we certify that everything prehistorical is myth ,and everything historical is only quarrels between local chieftains we are teaching our children to be fools. To say that after the European rule only India evolved into a world power is not truth. It was the other way round. Europe learned a lot from India and improved themselves .The Industrial revolution in Europe happened only because of the learning and the wealth and food that reached Europe .It is a good thing that we got technological advancement in several fields. We have to keep it up but know our real strengths and develop them too so that we can be the models of the entire world in food self sufficiency as well as in modern ways of technologies without harming our ecology. It is not an impossible task if we plan it in an integrated way. For that first we must know what we really are. Evolution itself has to be the revolution.

The upavana of Apothecary and role of Malabar in teaching Europeans:-

After the Alexandrian Greeks we find European (Portuguese, Dutch, French, British) interested in the fauna and flora of India. This is the fifth phase of European learning of India. Drawn as a pyramid the first phase in the IVC / Mehrgarh period happened in knowledge of Indian agriculture in Babylon, Persia and Assyria. The second in the Pre-Alexanderian era of Pythagorus, Herodotus, Hippocrates of Cos from Phoenicians and in between was the Hathseputh recreation of an Indian garden in Karnak. The third phase started with Alexander, Aristotle and the Greco-Roman period. The fourth phase was the Arabian Avicenna period which was more on the model of Afghan, Persian models of gardens during Buddhist times and hence limited (due to geographical peculiarity). The 5th phase came with sea route discovery by Portuguese and influx of European merchants to India. The knowledge of the variety of plants and medicines of India led to an expanse of material medica and pharmacopoeia of European medicine. The upavana constructed in Indian model in Karnak, Lycium and Alexandria were long forgotten. But a fresh series of Apothecary's gardens came up in Europe attached to study centers and universities in 15th century and these led to study of natural sciences, classification (Taxonomy) in Europe on a scientific basis. The classification in Lycium and Alexandria were based on hearsay and from peripatetic philosophers and collected manuscripts. It was not direct knowledge. But the botanical gardens of the Apothecaries were not like that. They had direct knowledge of what is done and how it is done in India from experience and from direct information from natives. Thus it was more scientific and more like the Indian way of taxonomy and knowledge. In the 1st century the material medica of Theophrastus and (Enquiry into the plants) and Dioscorides' material medica were noteworthy. Between 1503-1505 there was a renaissance of this knowledge. Leonardo Davinci and Albrecht Deut are some of the earliest botanists. After 1480 the unending granary of plant life and knowledge was opened up to Europe directly through Malabar which was hitherto unapproachable due to various reasons to the Europeans. European Zoology, Botany and pharmacopoeia and its classification (Taxonomy) evolved to its present form. Thus India was in the position of Guru for Europe for a long period extending to several millennia. If we consider the five phases as preprimary, Primary, High school, Predegree and degree levels, Europe got its degree in science in 15th to 16th century from India. But after that there was a leap of the disciple over the Guru in the post-graduate and research, technological phases.

In 16th century Botanical gardens Europe tried to grow all types of plants in the world. Only with wealth and sea trade this is possible. And they acquired both from the colonies. The competition of European nations for getting supremacy of sea trade and for wealth is no secret. Till that time the word Hortus had two meanings. 1. A book on botany. 2. A botanical garden nurtured by human beings. Till that time the Arab/Greco-Egyptian models of gardens alone were seen by Europe. That was the reason for these two meanings. Since the recreation of an heaven on earth was the goal, the name Eden gardens was also given to such gardens. The religious background of the scientists/doctors is seen in that naming. In Italy (Pisa in 1547, Padua in 1545, Bologna in 1567) universities grew botanical gardens. The Horti sick type of keeping specimens (of dried plants) started because many of the plants cannot be grown in Europe due to its climate. The specimens were used for teaching students by demonstration. The study

model spread to the North and in 1587 in Amsterdam and Lyden botanical gardens were made. Mont Pellier (1593)Hydelberg(1597)followed. The interesting part is that these gardens were kept by Vaidyas and looked after for knowledge of medicines. Just as the Aristotle-Alexander model these scientists prompted the rulers and merchants to collect as many plants as possible. One such Portuguese doctor ,Dr Gracia D'Orta was the first one to produce a European material medica called *Coloquios dos simples e drogas a coucas medicines da India* (1565).His Assistant Charles D'Ecluse translated that into Latin. He was the one who played major role in making the Hortus Medicus of Vienna's Maximilian emperor and the one who made a botanical garden in Lyden in 1593 .He spread several plants of India and America all over the world. The potato from Peru which was given to him by Drake ,reached all over the world in this manner. His successor was Paul Herman Chelsea who had close relation to Oxford botanical garden. His disciple was Dr Herman Borhave and to hear his classes in Lyden garden and Medical school, students from entire British Isles gathered. By this ,Maria Theresa was influenced to make a garden in Vienna .Thus Goa was the forerunner of a series of gardens. In the meantime Cochin had made a great contribution to European science. The Dutch boy Hendrik van Reede tot Drakenstein born and brought up in Cochin of a Dutch father made a tremendous contribution with the traditional knowledge of Kerala ,from Itty Achuthan ,and that is the Hortus Indicus Malabaricus.

Only when these series of experiments and experience came to Europe the knowledge of Hippocrates was the principle of Aired was understood by west. Both Coloquis and Hortus Malabaricus are entirely Indian books .With these and with the experiments done in the Apothecary's gardens of doctors in the west ,the European professionalism was added for making profits out of it and the rest is history. Whatever books have come after these books in Europe about South East Asia is on the model of these two Indian Books by European authors. This historiography of botany and pharmacopoeia is noteworthy .From 16th to 17th centuries most of the scientific books produced in India had their origin in India after European colonization. The books and knowledge of India were categorized as Brahmanical,Budhist,Jainist and Ezhava etc by Europe and thus the divisive class oriented /caste oriented taxonomy of regression also started with that .The classification based on the political supremacy (as Hindu.Islam,Christian)was the main reason for this classification by the Europeans. The dharma and lifestyle was totally misunderstood as Semitic religion and this was a major setback for India ever afterwards.

Books, printing and marketing etc came for global marketing. The Europeans marketed Indian knowledge in translated versions in their own languages. In middle ages Arabs had done this at a lesser rate but the discovery of printing in China made it at large scale. Science and knowledge originated in India, and marketed by Arabs in Europe ,and worldwide marketing for mass financial benefits and technology was by Europe. As Richard Grove rightly said:-“Epistemological ,textual, and cognitive origin of written accounts of South Asian Botany between AD 700-1800 find a center of balance well to the east of Venice (pp194 Ch 7 .Indigenous knowledge .Richard Grove .Ch Burkill chapters in Indian history 3 .Nature and the orient .Oxford 2000).

Colloquios:-

D'Orta from his own experience analysed the botanical and medical knowledge of the Malayali and proves that no one including old European and Arab medical men can excel their knowledge. This was a new original method at that period.D'Orta was a European

Christian doctor, doing research with financial assistance from a Muslim King ,and with the help of Arab /Muslim doctors practicing in the locality. Yet he showed a courage to opine his opinion that Muslim and European medicine is nothing when compared to Indian ancient medicine. The book was printed for marketing in India and Europe. It was written in the old style of Susrutha samhitha as questions and answers of Guru and shishya.He negated all Arabic and European medicine without thinking of the personal likes or dislikes or religious aftereffects and this is possible only with a scientific temper.He was a Jew and he was hiding the fact for fear of the Nizam .He had contacted all sorts of scholars .D’Orta says these vaidyas know about theories of Hippocrates,Galen,Aristotle,Plato .But he also writes that even the small people know more than what the scholars know in this country. Even though they have not read any old Arabic books on medicine ,these people know more medicine than the scholarly Arabic doctors employed by the Shaw, he wrote. He says ,though I am only a ignorant ,learned more than what the great Arabic scholarly vaidya of Shaw knows by contact with him, with Moors, Christians and from Genoas(The gentiles/ Hindu or Sindhu/later Hindu).And he says the greatest system is that of the gentoos.At that time Portuguese were here to make money and had no intention of learning other than methods of making money. Thus he analyses the mentality and scientific temper of different people and praise for the scientific knowledge and temper of the gentoos.As a conversation to his disciple he says in the book:-I will take you to see patients cured by Malayalis and Canarese ,that you may know physic more thoroughly”. He says but it is difficult to get knowledge from the Malayali Vaidya and they will first ascertain whether you deserve to be taught before giving instruction. This difficulty which D’Orta had in North Malabar was not experienced by Van Reid in Cochin. He did not have much communication from Malayali vaidyas yet what he got was excellent than the best recognized Arabic medicine and European medicine .He praises the kurumbi of Sahya,of gardeners of forest tribes and farmers etc for the knowledge of ethno botany they have. When D’Orta was writing the Europeans have not become a major sea power in entire world and had not established a worldwide network .By the D’Orta method and sound analysis and logical statements other doctors like Johann Koenig ,Honisberger etc decided to spread the Indian medical knowledge and methods in Europe and to be used individually .Claucius could therefore make it possible to bring to an academic/university level.

Role of Vaan Reide and Itty Achyuthan:-

D’Orta lived in Goa and knew that Malabar is the best place for pharmacopeic knowledge. But Vaan Reid grew up in Malabar.His father was the chief forester of the Malabar forests. He had contact with the local people from childhood and knew their knowledge of their ecology and also he enjoyed the forest and its life forms. The beauty of the atmosphere, the emotional attachment he had to it, and his childhood habit of recording everything he saw and learned from local people in a notebook ,later on lead to the creation of Horthus Malabaricus.He visualized the forests of Malabar as the great palaces of nature and its diversity of plant life, water resources etc as its beautiful gardens. He wrote that this is the real garden of the entire world and if at all any other place can be compared to it ,it would be Taprobana(present Srilanka)was his opinion. The reason he wrote is the monsoon climate being the same in both places. The geography,

the climatic peculiarities, the local people and their consciousness of these factors in their life, their scientific mindset etc were studied by him thoroughly and hence he depended upon local people for his scientific work. He understood that Europeans(himself being one)see the plant life and wealth of Malabar as a means for earning money and as medicine for treating disease only. But they were more than that to the people of the land. They had a consciousness of ecological relation of nature and human life and it was reflected in their lifestyle. Therefore though he had some preliminary discussions with Fr Mathew(St Joseph)in 1673 and 74 about the possibility of doing a work like Hortus Malabaricus,seeing the “Viridarium orientale”style of the father, he totally rejected that type of approach. Then he depended upon his knowledge on four persons. Three of them were Bhatts from Karnataka(Rangabhattacharya,Vinayakabhattacharya,and Appubhat).The last and most important was Ittiachuthan,an Ezhava vaidya who lived in coastal area. The Sanskrit book knowledge of the Bhatts were useful to Van Reid. But to identify each and every plant in the locality and to describe its uses ,IttiAchuthan was more helpful. For comparison, a young doctor who finish his MBBS can only prescribe medicines and quote academic things from books. He has no experience of how the medicine act ,nor does he know what are the ingredients of the drug, unless the manufacturing company details him about it. The Susruthasamhitha speaks of great doctors who have a medicinal garden attached to their homes and these were tended with great care by the “parichaaraka”who are experts in identifying medicines and their preparation. They had to be qualified in material medica and collection of roots, stems, leaf, flowers, fruits of any plant prescribed by the main physician and thus have to know the habitat of each plant. This work was done by the Adivasin of forests and mountains(who collected forest produce)and by trained paricharaka(assistants) in village botanical gardens .Under Itty Achutha’s leadership such a group of experts were organized into three groups and sent to different forests to collect specimens. Whatever they brought were drawn by three artists .Below each ,drawing its name, its qualities, medicinal value ,habitat etc were recorded ,by IttiAchutha .Van Reid records that the people (Adivasis)who were in IttyAchutha’s group were traditional vaidya(paramparayavaidya)and scholars in Ayurveda,and trained from their own father and grandfather in their job(as a kulathozhil)and they were a kulasangha.Thus each Adivasi group was akulasangha just as the village and urban groups of people in pre-European era. Their status and job was not considered as below standard. Van Reid also records that each of their family had several manuscripts and grantha scrupulously protected and given to next generation for protection of their system of knowledge. In Hortus malabaricus more details of Itty Achutha is given in Aryabhasha and in Kolezhuthu Malayalam lipi(script). Achutha entered the service of the Dutch company and he was a married settler in Cochin. But was originally from Malabar. He is said to be born in Charapuram Kodacharappally Gramam Kollada veetil in Ezhava samudaaya (note,Samudaaya is a group not a caste)and was apaaramparayavaydya(traditional doctor).The actual author was IttyAchuthan who stayed in Cochin fort for the purpose and he described them both in Malayalam and Portuguese language and his disciples wrote it down. He described it to Emmanuel Carneiro ,the translator and then made him write it in Portuguese language simultaneously. Whenever he had doubts ,he clarified each then and there .On 20th April 1675 IttyAchutha himself records that I have taught the classification, uses and treatment with these plants according to our system and our books .

In fact IttyAchutha decides which are the people to be sent, which all plants should be collected, which should be included in the work, which should be drawn etc and it was his contribution than that of Van Reid. But Van Reid and his interest became a cause for this .IttyAchutha had a style of naming two plants with same type of stems or characters with a species name ,and then add a prefix to identify the two and this is still followed in the science of Botany .For example Onappoo(The flower which is seen only in sravana season).He will give a prefix cheriyonappoo(small onappoo)and valiyonappoo(big onappoo).depending on the size of plant ,flower .By the name he even denoted the season in which it is seen in Malabar .This is a general way of naming in entire Malabar (probably elsewhere in India too).In 1740 Linnaeus accepted Itty Achutha's classification entirely and gave 240 species names in this manner. This followed in 1763(Adanson),1789(Jussieu),1818(Dennstedt)1867(Haskarl).In India ,Roxburg,Buchanan-Hamilton,Hooker etc also followed the style of Achuthan.In 1988 I saw a report that the remaining manuscripts (palm leaf)of Achuthan kept in Kollada house of Alappuzha were lost 7 years before that ,in 1981.(D.H.Nicholson,C.R.Suresh,K.S.Manilal,An interpretation of Van Reids Hortus Malabaricus .Konigstein 1988.1-22)The organization of a 15 member group of Scholars as Royal council of Cochin, and as a member of that group, taking initiative to make such a great work possible in a diplomatic way ,and thus give local knowledge of Kerala to entire world so that it influenced entire western system of knowledge and in this way trying to protect the ancient heritage of Kerala was the excellent job of Van Reede.There 784 plants with 794 diagrams described in the work. This was an original attempt at that time in Europe

From 1628-1702 Holland had become the center of tropical botany under Rumphius'herbarium Ambroinence.Linnaeus after studying under Johannes Berman and Borhav in Lyden came to Holland .Burman had taught Hortus Malabaricus to his disciples including Linnaeus. This Malabar/Dutch /Cochin/Lyden/Batavis network of gardens and botanical studies became models for all other countries in the world and still remains so. The natural love of garden in Rheede and IttyAchuthan and the ecological co-existence of Malabar ,became altered by the Lyden contact which gave importance to economic Botany than ecology.Lyden garden was the first to try coffee plantation artificially for making money. In Paris, Oxford and Edinborough Botanical gardens and medical schools were on the model of Lyden.

Lyden ,though gave importance to economic botany had a religious tolerance and allowed jews,Romans,Catholics,AnaBaptists,Anglicans,Calvinists,Lutherans and Quakers to study there .All of them learned medicine an botany there. The taught text was the Indian Medicine (Goa/Malabar/Cochin model).Lyden became very popular and seeing its potential in 1630 French Government had instituted in Paris "Jardine de Roi".And in 1654 we see the first company garden in Cape town.

Botanical knowledge in Colonial India(1790-1840):-

The scientific knowledge of India was called "Native knowledge" and it was systematically enquired and studied by Europeans to develop a science culture in Europe. Thus Europe learned science from the colony. One has to view the Marxian theory that the British made the botanical garden in Calcutta to grow Burmese teak for making ships has to be taken from this background. There was both economic and commercial as well

as scientific and learning motives simultaneously developed in Europeans by contact with India. The field scientist of Britain, Joseph Banks, said that Botanical garden of Calcutta was for study of Botany. It was created in 1746-93 under Robert Kidd ,a military officer for transfer of plants from India to England. But Kidd did not have knowledge of botany and he thought this garden is only a luxury and during his period the garden was just a nursery. In 1793 ,Joseph Banks had to interfere and remove Kidd from the post and entrust it to Dr William Roxburg, who studied medicine in Edinburgh under Prof John Hopp. He was a person studied in Linnaeus school. But some of Linnaeus description of Indian trees were rejected by him based on *Cocos nucifera* and grasses. According to Linnaeus system Roxburg named 5000 species of plants in Calcutta Botanical garden. After Roxburg Dr Francis Buccanan was selected. Unless one gets a subordinate from India ,then only one from Europe must be selected and that too a person who has studied natural history was decided .At the same time the company rejected Nathaniel Valaigh saying that he is too scientific (and not concerned with practical economical aspects).. William Griffith (1810-45) started experimental practice in plant physiology there. He said without knowing the physiology how can we know the changes (pathology) happening in plants? How can one know a plant, animal or human unless one know from the seed, its germination, all processes and stages of growth and decay and functions? The method of Indian science is in this way ,right from the beginning .In 1783 William Jones came to India with a specific aim.” To know India perfectly, as no other European had ever known”. He made the Asiatic society of Bengal with aim of learning the functions of man and his environment ,and its effects.

In Indian science of life man, animal, bird, plant and all life is a single whole. Therefore the study of its nature and function and of diseases and balancing also go hand in hand. It is a holistic approach. Linnaeus had divided Botany from medicine and from zoology and neglected ecological co-existence of all. His specialization technique and learning with a dry specimen of plant (and a cadaver) was mocked at by Griffith due to this extreme specialization which loose all natural feelings. Because India is always Holistic in its approach ,the artificial specialization technique of Europe was rejected here and in 1830 itself the ecological model as against the Linnaeus model which neglect ecology developed among Europeans practicing here ,in India. The approach of Alexander Von Humboldt was related to this. For the shift from “Natural history” to “history of nature”, John Royle ,born and brought up in Kanpur (1799-1858) became instrumental .He had gone to England to get his official Medical education and returned to take up responsibility of ShaharanPur botanical garden. Just beneath the Himalayan forests ,in this gardens he formulated his ecological theories. Royle was not a Botanist but a Doctor by Profession, just like Itty Achutha. He did not agree with the trend of specialization narrowing down to inhumane practices. Just to name and identify a plant is not the goal of Botany and it is just a process equivalent to give a script to a language, he said. His approach was ecological as that of Humboldt know a plant, know its soil, its water resources, its environment ,he said. In 1833-39 his Illustrations of Himalayan Botany were published. The geography of Indian plains and mountains, geology, special climatic conditions, seasons, the heat and pressure of Simla and Mussorie, the different plants and cattle in India grown in specific seasons in specific places etc are all included in his book. With this he had given 207 plants and their descriptions and where they are seen in the

world. The Indian plants in comparison with the similar plants in other parts of the world and their similarities and dissimilarities are given. This scheme was as follows:-

Tropical east Indian islands, Tropical Africa, Brazil, Guiana, West Indies ,Florida	Thiruvithamkur, Cochin, Malabar, Ceylon, Malaayan peninsula, Chittagong, Bengal, Lower Assam
East & west coast of Africa,	Coromandel coast, northern Circars, Konkan
Southern states of N A merica, Egypt, N. Africa, Syria	Gujarat, Bihar, Doab, Delhi, Malawa
Mexican highlands, lower mountains of Spain	Mysore, Deccan mountains, Rajasthan
Southern part of Africa, extratropical new Holland , South America south of 23 degree 3'	Saharanpur, North Doab
Mediterranean	Dehradun, Himalayan areas
China, Japan, Middle Andes, Peru, Brazil mountains	Nilgiri, Assam, Himalayas
North of Europe, North of Asia, N. America	Oak and pine areas of Himalaya
Arctic, mountains of Europe, high parts of Andes	Himalaya above the forests

His environmentalism included human ecology and social forestation as well. The ratio between demand and supply should be controlled so that the balance of natural resources is not disturbed. Natural forests were enough for human beings when the population density was less. When population increased, people destroy natural forests for making agricultural lands and for making homes etc. Thus the natural forests which is the best wealth of humanity is lessened. When a people achieve self-sufficiency in food production, and have small scale industries needed for day to day existence a system of barter develop in which the excess is shared by neighbors .This barter later became a worldwide network .The division of labor which naturally developed in this system they applied to plant classification as well. When the soil and climate and geography of a locality give it prosperity ,other nations aspire to get that and that demand had naturally resulted in barter and trade with neighboring civilizations .That is how India entered world trade.

And according to the geography ,human demand and supply the rich tropical land had been in demand from ancient times. So Royle said that the growing tendency among modern European scientists that there is racial intellectual superiority of Europeans over the east (what Joachim von Schouw had called mental superiority of races) does not exist. All are equally intelligent and superior provided they have experience in their geographical and productive economy and develop a balanced sharing system for self sustenance and sharing with others. Thus he argues that the Europeans who came to India ,learning science from India and spreading it to Europe is only a barter of intelligence. Europe gains by way of getting its science consciousness .The Hortus Malabaricus is proof for intellectual superiority of the race of Itty Achuthan over the European race because they borrowed from him to develop a system of knowledge. And for Indians including Itty Achuthan ,the knowledge is a blessing of the nature and climate and the

ancient system of dharma developed by them. That dharma itself is the gift of nature for several lakhs of years. In science, tax system, in agriculture and industries the people are so experienced so that Europeans had taken their help to learn them. They had translated all they collected into their languages and taught fellow Europeans the wisdom of the East. William Jones learned names of plants from a Sanskrit scholar who was his Guru. He even suggested that one should use Sanskrit names not Latin for naming plants.

When Council of Linnaean society in London objected to publishing articles of Asiatic society scientific articles S. Goodenough told them that more publications mean more data and more data mean more science. Dr John Forbes Royle, was a European doctor who grew up in India and who did research in Botanical garden of Saharanpur and when he saw such strong views in favour of India he was expressing the view that India was not only the Guru for spirituality but also for administration, trade, commerce, Zoology, and medicine and other sciences to Europe.

Meteorology, ecology and native knowledge:-

Drought, monsoon, whirlwinds, change in climate, seasons, annual meteorological predictions based on observations and the knowledge that all this is due to undercurrents in the southern ocean existed among local people of India (Natives). Now we call it ENSO (El Niño current and southern oscillations). The rhythm of this change was known and predicted by them. The sea trade was based on monsoon winds and thus there is no wonder that they knew this. The predictive astrology of seasonal changes like drought and famine, excess or less rain etc developed for the sake of agrarian economy. But also for trade route management. Both people, traders, rulers were therefore interested to know that in advance to plan their activities. Only in AD 1500, Europeans came across such knowledge of sea. Only in 1701 they understood that the Indian monsoon is not a local regional phenomenon but is a global one. By 200 years they understood the rain cycles, productive cycles, trade and how it affects people and environmental role in economy of the land etc. In 1791 they analysed what they had observed. This was first done by East India company Botanical Medical service to understand the interrelationship of nature and environment and man and his agriculture and its mutual relation. Same type of study was conducted in Caribbean. The saying of natives that if forests are not protected rains will fail was found to be true by them. For the global analysis in 1816 Botanist and medical doctor Francis Buchanan Hamilton was sent to Bengal by Wellesley. He did research for 7 years (1807-1814) and said that what the natives say of interrelation of deforestation, lack of rain and famine are true and it is scientific. Only then William Roxburgh started a programme of forestry in Bengal, Bihar, Orissa, and West Bengal. (East India company areas) to increase rainfall.

Australia, Indonesia, India, North and South Africa and Pacific coast of South America get heavy rains and floods by the warm event or ENSO. These were the sea routes of ancient Phoenicians. Therefore the rhythm of seasons in these places help us understand the unified rhythm which is teleconnected to each other. 1877-79 saw the most severe artificially created famine of India and only after that the European scientists saw reason that the people's health was due to climate, food and the lifestyle they had. If the balance is lost severe imbalance results in disease. The several discussions about this were

conducted by India's surgeon general Edward Balfour. Or it took one century for them to agree that the natives were right. In 1780 they thought about air, weather, volcano arose and in 1783 Benjamin Franklin said the extreme cold of Paris (temperate) is due to volcanic action in Icelandic Mount Hecla. By this time German and Danish missionaries were doing meteorological research in Madras. In 1776 Sir William Roxburgh reached Madras. From 1778 he was looking after an ancient Mughal garden at Samulkota. In 1778 and 1790 this Surgeon's meteorological observations were published. In 1788 Sir Joseph Banks, influenced by him, gave his own meteorological data to be published in Royal Society transactions. Why should a young surgeon take interest in meteorology as soon as he lands in India? He was the star student of John Hopp, the curator of Edinburgh Botanical garden and a plant physiologist. Therefore he was in contact with two intellectual groups

.Royal Society of Science as well as Arts. This and the lifelong love of Hopp's in planting trees had made him do such a thing. The relation of health and environment his profession of Medicine had already taught him. Thus in 1776 itself he started his interdisciplinary programme of meteorology, Arboriculture, Medical practice and medicinal plants. By 1820 he became the only European doctor who had collected maximum amount of meteorological data. Sitting in India he argued that the reason for famines and so many diseases which came with famine in India, was the extensive capitalistic destruction of Indian forests by Europeans. After 1770 the meteorological data collections all came from doctors. They were the only people who thought from the point of view of the health of the people, health welfare, public health through protection of productive trees and gardens and fields. The new science of Meteorology started in Europe in France by the conference of Society Royale de Medicine there. The European naturalists started to understand that each plant is useful for health of man and even the plants which do not have direct medicinal use are purifying air by their presence. Thus the theory of protecting all life became a new acceptable theory of science from the east.

WHAT TYPE OF A LIFE DR ROXBURGH LEAD?

He was a practicing surgeon in Nagore. He was protecting the botanical garden north of Madras in Samulkotta and was tending plants there with involvement. The seeds and saplings thus reared carefully were also sent by him to other Botanical gardens all over the world. From 1776 to 1793 for long 17 years he lived thus and at the same time for 17 years he had been measuring temperature and pressure in Coromandel coast with a Nairne thermometer and a Ramsden barometer. All his observations, analysis and conclusions were neatly written and sent to Sir John Pringle of Royal Society of Britain. But many of them were lost or not published. His first article was published in 1778 Philosophical transactions of Royal Society by Pringle. In 1782 Dr Roxburgh wrote to Banks that his essays are being neglected and lost in Royal Society. In 1790 another set was published. It was in Nagore in 1780 that he understood the exact relation of famine and diseases. He recommended that the company should sponsor a programme of cultivating fruit trees in riverbanks and on either side of roads so that any hungry man can eat and get nourishment and free from disease. Since he gave exact data for 17 years from a particular locality in India on pressure, temperature and other meteorological observations, the related global changes elsewhere could be compared with it and relation of Indian monsoon to El Nino was understood. If one knows Monsoon cycle one knows El

Nino and vice versa. In 1791 there was a strong El Niño. After 1780 famine from 1789-92 Madras presidency had severe drought and Godavery delta population drastically decreased. Alexander Beatson reported on this as:-During these two years there was no rain. More than half of the population in northern Circars died of famine. The rest became too weak due to lack of food. When rice was mobilized from Malabar coast, the news spread among people and 5000 people from Rajamundry moved to the port to get rice. But they could not cross more than 50 miles, and before that many of them fell dead due to sheer fatigue “

This famine was a topic of discussion in Europe and Edmund Burke has mentioned about it. It was here, the European doctor Roxburg made a very brave comment about this occurrence. He said the pre-colonial irrigation projects and agricultural methods were scientific to the core and suited for the geography of India and the programme of the company to discard them was totally irresponsible and the famine was actually created by that policy. If not, India might have as usual fruitfully avoided such a change in climate as it had done before. This opinion Burke also shared. From 1782 onwards rain was decreasing in South East Asia. Roxburg had observed that. When he sent such observations and conclusions to the company in 1793, company immediately transferred him from Nagore to Calcutta.

The experience of South Indian famine and weather and health of people made Roxburg think in three directions.

1. Comparison of context of history and chronology with 1789-93 famine
2. Discovering that the drought which is usual in India had become a famine by the irresponsible interference of the company in the local methods of resistance to it
3. Project to plant as many fruit bearing plants and trees so that one can give food even in famine times, and prevent soil erosion by roots, and increase rainfall. The forestation with fruit trees natural to the area will give all the effects at one stretch. (increase, food, prevent malnutrition and allied diseases, prevent bad effects of droughts and famines, keep people healthy and also by preventing soil erosion ensure rain in plenty).

The history of previous famines of India he had some information from a Brahmin accountant of Raja of Pithanpore. The description of a famine in 1685-8 (during the accountants grandfathers time) was given in his manuscript library of accounts. In that period only once rain fell in northern provinces and by three years population came down drastically. In 1737 there was a minor food shortage and in 1770 in Bengal there was a local food shortage and famine.

The transfer was in a sense a punishment transfer because he was asked to continue the experiment of teak sapling growing in Bengal and to make teak plantations in Bengal, Orissa, Bihar as a monoculture plantation (not fruit trees). He took teak saplings from Rajamundry and started the programme and it became successful between 1793-1813. There he did observation and comparative research on growth of natural teak and the artificial teak plantations. He continued his meteorological observations there too and many of them were published in Medical journals. (William Roxburg. Remarks on the land winds and their causes : Transactions of the London medical society . 1. 1810. 189-211)

In 1791 there had been a drought in St Helena also. Similar drought was there in west Indies too in same period. This global experience of famine in three places was

compared by Alexander Beatson (East India company Governor of St Helena). Though he had asked for a reduction in revenue recovery, the company did not grant it. And people of the island rose in revolt and Beatson himself had to control it (as per company instructions). In 1791 Peru had floods, Mexico had famine and droughts and South Africa had famine. In Egypt, China and East Indies there were long recorded history of floods and droughts. But such observation and scientific recording was new to Europe of that time. Meteorological observation was not a science of Europe but of the East and the tropical Americas. This science Roxberg, the surgeon, taught Europe from Indian experience. When in 1791 Australia had a severe drought, tanks in Indian model were constructed there for water (drinking and irrigation) by Governor Philip. Thus the four British colonies were experiencing same conditions and comparing them with each other and discovering the role of human interference and its bad effects on nature. They compared geotectonic mechanism, artificial deforestation, El Niño, global climatic changes and possible ways of preventing them. But the study was only on paper. The company did nothing to prevent disasters and was intent upon making profit irrespective of human suffering or not. In 1877-79 India saw another famine. By 3 years 50 million people were dead. In Indian famine commission report of 1890 its description can be seen. The result was the establishment of three departments: IMO or Indian Meteorological office, Agricultural department and the forestry rules of 1878. When atmospheric pressure increase droughts happen both in India and Australia was noted. Drought and famine happen simultaneously in these two distant places was confirmed. But there are certain droughts which do not occur simultaneously. The reason is southern Oscillation which is a weather teleconnection. In both continents of Australia and India in May, drought related to El Niño occur (just before south west monsoon). This southern oscillation is described in Indian astronomy for several millennia and in modern times the credit of discovery is given to Charles Todd and H.H. Hildebrandt. Sir Gilbert Walker of IMO named each of the southern oscillations at beginning of 20th century and showed its relation to rain in Australia. He found that Australian summer rain can be predicted correctly. The rain of southern Australia was predicted in spring, by Quayle. In 1970 El Niño became centre of global attraction again. Because in that year Australian meteorologists developed a special interest in it. Prediction of spring and summer rains and droughts and meteorology was a science that was prevalent in entire India and each village community had a official employed for this very purpose whom they kept in great reverence. The barter sharing system of the panchayath looked after their requirements. (More about that in my astronomy studies. Therefore not repeated here). Before the great Mutiny of India the prediction and study of East India company officials, and after 1857 the study of the officials of the empire taught a global climatic and meteorological unity of the globe to Europe. Russell in 1896 compared Indian and Australian droughts as below.

Australia	India
1789-91	1790-2
1793	
1797	
1798-1800	

1802-1804	1802-04
1808-15	1812-13
1818-21	
1824	1824-25
1827-9	1828
1833	1832-33
1837-9	1837-9
1842-3	
1846-7	
1849-52	
1855	
1857-9	1856-8(Mutiny of India)
1861-2	
1865-9	1865-6
1872	
1875-7	1875-7
1880-1	
1884-6	1884

From this one find that famines are less in India .Between 1790 -1802 famine 10-12 yrs interval is there. From 1802-12 also 12 year interval exists. Again from that to 1824 is a 12 yr period. This 12 yr cycle suddenly decrease from 1824 onwards .From 1824 to 1837 the intervals have become 4, 4,and 3 3ach between three famines

Then there is a long spell of 19 years of famine free period and the severe famine of the year of Mutiny happens. Then next famine come 9 yrs later. Then 10yrs ,9 yrs intervals exist between subsequent famines. This long interval is not there in Australia and human sufferings are more frequent due to frequent droughts and famines. This is because Australia had not evolved a system of prolonged observation, resistance and withstanding such conditions by a well built agro economy as India had done. This co-operative agro economical unified Governance and political system of India did not exist in Australia so that it could not withstand frequent small droughts .

From this chapter what I want to stress is that India had been the Guru for European sciences. And India has the potential to come out of any averse situations due to her geographical position and fertility of land .If only people understand their strengths as well as weaknesses and co-operate in the optimum way ,such an ancient land can save the entire global community .But ,leave the nature alone. Do not disturb it at any cost, If we disturb it we jeopardize entire global society, not only humans but entire life forms. And also that a Medical person is the best think of such things as Roxburg did. Because the treatment of individual persons alone is not sufficient .The treatment of the mindset of entire society and nation so that it see reason and become healthy together is the view of a responsible doctor. The responsible doctor ,as a world citizen has to be concerned not only about his practice as a means of life but also of good water supply ,good nutrient foods, and good music for community health and welfare and for good value based education and ecological lifestyle not upsetting ones nature and of earths nature so that all prosper together ,for peace of all .That is for the world peace ,a doctor has to be a socio-

politically motivated being ,not just a technological ,and practice oriented selfish personality!!!Roxburg taught us that model.And India had taught him that Model.

Solutions:

We have seen the geographic and climatic conditions of India and of Kerala in particular reference to Malabar as a low-lying ,high paddy cultivation zone and its problems and peculiarities from prehistoric to modern times. We have seen that Cassia fistula (Konna) bloomed out of season in Kerala last year and drongo(insectivorous bird which hatch eggs in Feb-March shifted to earlier times) has changed its breeding habits. The threadfin bream (two varieties of kili meen)has shifted spawning season to cooler months of October to March.(because of raise of sea temperature to 0.3 degree C during last 15 years).Cochin based Central Marine Fisheries Research Institute(CMFRI) states oil sardines which were abundant in Kerala coast was because of the warm temperature for spawning, and now they have a wider area of spawning from Maharashtra to Orissa coasts and this shows rising temperatures there. The impact of all such changes on rain-fed agriculture ,lifestyle of communities in coastal area, the regions biodiversity being lost by it, and shrinking of ecosystem of western ghats were discussed in detail. In Tamil Nad also the changing patterns of rainfall is raising anxiety. They are expecting short but intensive rainfalls in future .Usually they get rains spread over months in equal intensity. The cities, coastal areas and deltas are under threat of floods if the change happen but that was because of our poor planning and poor vision for the future. What our ancestors foresaw from experience our new administrators could not foresee. If they had foreseen it ,they would not have made so many houses and constructions where they should not have been constructed, and they would not have neglected age-old practices of agriculture for new ones which have no bearing for our climate. Why did crops in 1000 acres of land in Tiruvarur and 500 acres in Naagapattinam in delta area damaged by floods? If the seed of Pokkali (which is always remaining above water level)was used in low-lying areas would this have happened? If people were cultivating in all the low-lying fields and were living in plains ,and allowing forests to grow on hills and hillsides would it not have been the best policy for protection of ecology, human and animal life as well as for protection and greater production of grains? So planning to live is not there in our present day administration is very clear. And the removal of co-operative farming for individual property farming has lead to several acres of land being uncultivated .We have to address these problems first. Then we have to understand the dictum that to attract tourists forever ,the “concrete” jungles (Construction works)are not enough. The protection of nature, heritage sites and cultural identity is needed for tourism promotion. Either way ,traditional ways of thinking ,living as part of ecology has to be redeemed.

1.For Indian conditions ,high cost projects are not suitable. Devise low cost methods
Devise methods for high moisture content and standing waters .(For wetlands of Kerala)
For dry land which needs irrigation facilities and with less rainfall the method has to be

different. This has regional differences .

Do not try to impose monoculture on high fertile biodiversity areas like Kerala.

How to reduce labor costs?

One is to Do yourself. The other is to do as a co-operative farming by whole village .For this ,one has to conduct awareness classes and convince all ,including labourers, and people who do not cultivate their land however small it may be, and also people who are doing non-ecological exploitation of land including construction works.

To reduce energy requirements :-Use biogas and biological manure .For this protect domestic animals (cows etc)

Use co-operative measures of group farming by entire village

Procuring seeds ,seed selection, packaging, transportation charges to be reduced

Use simple technologies wherever possible for maximum yield. Use locally available fuel, nonconventional energy sources, and low-cost technology, and regional seeds suitable for geographical area.

Improve rice processing as cottage industry

To reduce weeds growing in between rice saplings during the monsoons there is a simple method of spreading dry hay or paddy straw between them. That will act as a effective weed suppressant. Some people also spread jatropha leaves but take care that only leaves and not the stems are spread because jatropha stems easily grow roots in the soil. This is a easy and cost effective system for preventing weeds so that the cost of removal of weeds can be minimized.

Systematic rice intensification (SRI) system can be resorted to. This is supposed to use least water (hence suited for areas with dry climates) and releases little methane .(Any type of natural cultivation release less methane).

All these can be done at short-term project levels

Apart from cash crops plant all vegetables needed for village in each house in kitchen gardens. Encourage children in schools to do it .This will build up a new generation of citizens who know the value of food production and love nature .

2. Packaging and transport losses to be brought to very low levels.

This has to be looked into by Govt

Irrigations with canals ,bund formation etc are to be looked into. The tanks, canals, wells

etc should be protected just as rivers. And none of the existing ones should be destroyed for construction work. Rain water conservation scheme and schemes for preservation of

natural surface and ground water should be undertaken collectively by co-operation of entire village .

Storage of grains for village use in conditions of emergency ./famines.

Cattle/fish /growth and use of it as organic recycling of energy process in food cycle to be encouraged .That will reduce the energy pollution and also cost of manure

3.Plant fruit trees in every village instead of trees which have no fruits and which are just for decoration and timber. This will be useful in famine /drought and also will keep nutritional status of all children in village and reduce incidence of anaemia and leukemia in villages and reduce cost of treatment and hospital stay as well.Reducing the hospital expenditure by increasing the food sufficiency and vitamin requirements is better policy.

4.Goraksha:- protection of cattle and their health .Healthy environment and food ,grazing grass and hay and food for them .Have music for more flow of milk as well as for growth of animals and plants.

Healthy cattle more productivity. More milk. This is urgent step.

Crossbreeding in village itself by a strong high variety bull(a proven high quality bull as in olden days .I remember a bull in Ambazhathel for this purpose)) in village or by semen banks.(at state/regional level.This will cost more than an individual bull and the state has to have facilities for this)Train manpower for veterinary services. Cross breed development by DNA markers is available in the present world.

Develop the feed and feed quality standards for cattle consistent with the breed and the yield.

We can upgrade the crop residue and biodegradable waste for use as cattle feed.

Development of high yield fodder seeds .Hygienic sheds for cattle reduce risks of diseases and cost of treatment.

High quality of milk processing to be practiced. Train farmers for hygienic ways of collecting milk.

Use biogas as power supply for homes and for industries including uninterrupted power for milk products /processing

Treat cattle with care. They are fundamental to our agrarian economy and love them and talk to them and sing to them as you work .That will keep them happy and healthy and give you more.

Make a pollution free environment both for man and cattle.

3.Timely harvesting and sowing of seeds of vegetables and other crops .Educate growers regarding proper maturity indices in harvesting. Proper post harvest treatment like vapor heating etc should be taught .High yield of vegetables and sharing them with

neighbours, and with local markets should be encouraged rather than sending them abroad in poor preservation conditions which will make high levels of loss .

4. Promote Horticulture projects . This is having a major boom in business. Encourage farmers to grow on a buy-back agreement of barter ,vegetables and fruits suited to their regions with neighbors who do not have that condition.(esp. fruits,veg,grains etc). This will give a permanent market for all produce for all people.

5. Long term programme as a multipronged programme .

The transport infrastructure

Financial assistance to co-operative and private institutions to develop infrastructure

.CA/MA(controlled modified atmosphere) for storage and transport facilities.

Processing of fruits/veg at farm level to reduce waste by educating farmers and giving financial assistance.

Some of these are given by A.P.J Abdul Kalam (Visions for India pp 74-80)but with more of technological programmes which increase cost of production and thus end up in less self sufficiency which is applicable only in certain conditions. In Kerala as a special region many of them are not practicable and are cost consuming and unnecessary too.

Therefore I have charted out a more practical method suitable for our region. And for all the poor farmers my methods should bring sustained food and productivity and hunger should be eliminated as well as nutritional deficiency so that all get immunity at a cost-effective way ,reducing cost of high medical treatments, cost of technology and artificial methods of farming. In this mine is different from that of A.P.J. Abdul Kalam who gives much importance to the high cost technology for production .

ICRISAT (International crops research institute for the semi-Arid Tropics)is trying to develop crops that grow in warm and dry climates to find a solution for an expected future global warming converting the entire earth into dry arid lands. They work on crops like millets, sorghum, chickpea and pigeon pea and groundnut etc .Millets and sorghum has high salinity tolerance. They produce good yields even in warm weathers. The work of ICRISAT is based on the assumption that warmer temperatures, persistent droughts and erratic rainfall could send poor farmers right back to the bottom of the development ladder. The brewing up of the perfect climatic storm has a confluence of

1. Climatic change

2. Dessertification of once fertile lands

3. high energy demands of the world

4. an exploding population which needs to be fed.

So ,how we deal with this should be with extreme care and proper planning.

Each region has its own climate, its own good crops and to take what the ICRISAT say

at face value is therefore not good. For rice growing low lands it is better to improve rice growing itself. Do not try to convert to millets and desert seeds fearing a catastrophe that might occur or not. But be selective about crops in different seasons.

The grains suitable for India (its different regions) have been described by various texts right from Veda and has been tested through several millennia and by Indus valley period a agrarian ecology and sharing had been in practice (or even before that) and this had continued till British times as I had quoted from Logan in the case of Malabar. This continuous system is our strength. Therefore, based on regional peculiarities and regional seasonal rainfall (which has nothing to do with general conditions or theories) make practical plans and for this each individual in the village and each association or group in the village can contribute their share of service and helping hand as a co-operative effort

. This is what a panchayath is for. It has to be for the welfare of all in the village and for the welfare of the neighboring village and as a Venn diagram the welfare should extend to entire nation and the globe. That is the concept of my health village scheme. It works on co-operation, love and common welfare and is free from all differences on caste, creed, community, race, gender, religion etc. It is based on Indian geographical features, Indian climate and its observation and experimentation over millennia by our ancestors and how they saw it and solved it and how the present generation see and solve it so that the posterity (next generations) will see the land as green and as full of fresh water and food and enjoy it and make use of it for propagation of a healthy happy race.

In a recent report on Hunger Index of India we find a similar pattern in Kerala, Andhra and Assam because of its rice-growing low lands and climatic conditions. These are the only three states that produce enough rice, the staple diet of the South Indian to a great degree and yet their hunger index is ranked "severe" though slightly better than the other states. The only other state that has an equal status is Punjab and that is because of the Green revolution of the five year plans which gave high yields of wheat. If the three states mentioned above stop growing rice, and ask for rice from other states, or from the center, it just shows that their policies on agriculture especially Paddy growing has not been adequate. The geographic features of Kerala especially South Malabar and Kuttanad are best for paddy growing and if people start converting these wetlands for other purposes they are jeopardizing not only the food sufficiency of the region, but also of entire nation and by that they make the nutrition, health and agroeconomy of nation suffer. If there is no rainwater or groundwater there is no food. Without water and food, there is no life on earth. The sustenance of life is based on agricultural activities of human race and in a geographically suitable land (like kol puncha wetlands) where both agroeconomy, fisheries and green tourism can thrive and bring the state more revenue as well as national pride, both the rulers and the ruled population should be aware of their key role.

Nature has blessed us with beauty, water, rains and food. Let us sustain it, sustain a healthy, happy and unified life in tune with nature.

Being an Indian :

An Indian citizen's dreams of future India

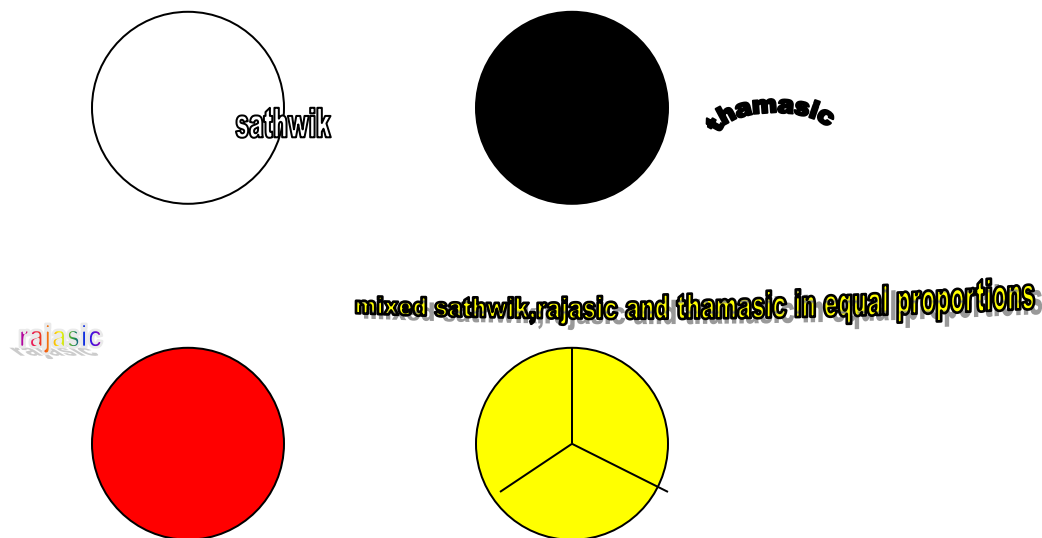
Dr Suvarna Nalapat

Swami Vivekananda said : Look back ,as far as you can ,drink deep of the eternal fountains that are behind ,and after that look forward ,march forward and make India brighter, greater ,much higher than she ever was.”. I have great optimism in the potential of India to grow faster than ever before and eliminate poverty and malnutrition ,and achieve physical, mental ,intellectual and spiritual health within a reasonable period. But for that we have to modify our political visions and policies and seize the opportunities that lie ahead .As Nehru said in his speech on granting of Independence , the celebration of independence was only a step ,an opening of opportunities ,to the greater triumphs and achievements that awaits us and unless we are brave enough and intelligent and compassionate enough to grab the opportunity and accept the challenges of the future we wont achieve what we strive for .Each citizen of India has to contribute in a small or high way ,depending upon the opportunity he/she had in life to achieve the aim.

Being an Indian ,brought up in a rural background ,and being a professional Doctor in a urban set up, as teacher and consultant Pathologist in a Medical college ,my views on Indian society and healthcare is both a field-view and a book-view as mentioned in Andre Beteille's book Society and politics in India ,Essays in comparative perspectives (Oxford India paperbacks 1999 OUP).When he speaks of Anuloma and pratiloma marriage laws of Indian society ,I understand it as a Mendelian law of inheritance which the Indians had known and practiced from time immemorial and this I know ,not from any book ,but from my mother's stories .She had not studied in any formal schools .But had a traditional education at home ,both in Malayalam, English ,Sanskrit and Ayurveda and literature as it was usual for girls of a Nair family of her times (She was born in 1911 and passed away in 2002) .Most of the things she had learned from her own ancestors .She told me the laws of inheritance and the laws of genes which determine a person's ascend in hierarchical systems and the adoption laws . And I later on understood from the history texts of the Cholas and Pallavas that what she told as her own inheritance was the same law of inheritance and adoption of Chola/Pallava kings .How interesting to compare such a thing with Mendel's laws while you become a Botany student (which I became in 1962) and then extend it to genetics,socioanthropology and the sociopolitics of ancient India ,when you become a medical teacher !!

I will just show the anuloma marriage system from a Mendelian perspective .A Brahmin is allowed to marry from his own as well as from the three lower strata ,A kshathriya also

is allowed to marry from his own and the lower strata, and Vaisya too has the same rule. Sudra can marry only a sudra girl. The sudra women can marry any of the above types of males. The Brahmana woman and the sudra man are the two categories who practice monogamy and continue the purity of the two races. The science behind this is actually a mixing of Guna (quality) called sathwik, rajas, thamas. Thriguna mixtures and balancing, in short. It has nothing to do with body color or anthropological features of the physical body, but has everything to do with attitudes/aptitudes/quality control for preservation of endemic societies, at the same time allowing mixing so that biodiversities are encouraged. And it has nothing to do with sexuality, but everything to do with ascending the ladders of society and the women from lower stratum preferring men from higher strata and women from higher strata not preferring the men from lower strata, due to educational, intellectual and other qualities. It was actually for the sake of the women and children and not for men, this system was devised. Brahmana means sathwik quality. (He may be black or white in skin colour. Most of the Brahmins are black in South India). Kshatriya is Rajasic and Sudra is Thamasic. Vaisya is a combination of rajas, thamas, and sathwik in equal (1/3) proportions.



1. Brahmin + Brahmin = Brahmin (Pure sathwik)
2. Brahmin + Kshatriya = Sathwik and rajas mixtures of various shades. Pure sathwik, pure rajas and mixtures can be formed
3. Brahmin + Vaisya = Pure sathwik, pure rajas, pure thamasic, mixtures of all three in various proportions made
4. Brahmin + Sudra = pure sathwik, pure thamasic and mixtures of sathwik and thamasic
Sudra + Sudra = pure thamasic

From this one can understand that the rajas is always mixing with thamas and sathwik and making different shades of genes while Brahmin male and sudra female are alike,

permitted to mate with any of the four . The sudra male and Brahmin female are alike ,not allowed to mate with any one ,so that the pure race of the biodiverse species with sathwa and thamasic qualities (the two ends of spectrum) are preserved . It is just like the wild and domesticated peas and paddy and ,animal and plant species that the rules for human beings also were devised by the ancients. How can one say that they didn't know what we as educated doctors and biologists know from our books ? They knew from the fields and we from our books .Theirs was the field-view and ours only the book view of sociology .A farmer, a hunter/gatherer noticing the biodiversity naturally comes to the field view of inheritance (which was late for science until the time of Gregor Mendel) and the modern science student comes to its understanding from his science books .Why was prathiloma not allowed ? Because if it is allowed the purity of both the sathwik (intellectual) race and that of the thamasic race (original biological) will be jeopardized . Only the rajasic(royal and businees men) will survive . Survival of fittest depended on preserving all . The sathwik are always a rare minority race ,while the thamasic also is a minority race .The thamasic women were allowed the privilege of taking a higher order male ,because she by that act preserves her race and allows her child to come up in the integrated order of society .That is not happening when a Brahmin female marry a sudra male .Therefore ,such a marriage(which is based only on physical /sex attraction)was condemned as antisocial behavior .To protect biodiversity, this legal system was essential for the primitive tribal people .That is why we find endogamic societies mainly among adivasis/tribals and among Brahmins .They were conscious of protection of their identity and qualitative existence .The accessibility of upper caste men to lower caste women is equal to the accessibility of lower caste women to upper caste men and inaccessibility of upper caste women to lower caste men is equivalent to that of lower caste men to upper caste women and hence there is a male: female equality in upper and lower stratum .A few years ago (in early nineties)I had pointed out in Madhyamam daily a custom among Namboothiri family of North Malabar to give a girl in marriage to a Theeya(sudra) in case the Maannanaar chieftain of Theeya does not have a woman in his endogenous tribe to marry .That was a prathiloma custom, sanctioned by society .Why was that sanctioned ? Both the Maannanaar male chieftain and the Brahmin woman being pure races ,and not mixed ones, both decided it a necessary evil to continue the race of the Mannanar chieftain to remain pure .And this shows the society was not that rigid in the laws of marriage and they considered human beings not different from plants and animals and birds which interbreed ,yet keep their races pure .The laws were just for that and the quality of human beings and the profession determined by quality/preferences were more important for a society which was closely interknit as guilds. In fact the marriages of Mogul family (Akbar ,Shahjahan,Jehangir etc) were based on such considerations so that they could integrate into the Indian society as ruling class ,helped by Rajputs and the tribals and Brahmins .That shows ,the pattern of inheritance in India was not at all very rigid .

How can one achieve equality in any society ?

Wealth,power,status,education,socioeconomic relationships have to be made equal and balanced .How is that possible ? The thought of such a equality(Samathwam) brings out some reforms in a society and one has to consider the rules formulated for bringing that and which unfortunately degenerated to inequality later on due to various factors. A child born of a Brahmin father from a lower strata woman has a privilege of gene as well as

parental love from a male of high position . So ,if a lower strata female marry a higher strata male ,the relation is either for money and status(Vaisya father)sociopolitical power (Kshathriya father) intellectual power (Brahmin father) and a woman's choice of mate in such cases is considered not as a bad taste . But if a Brahmin woman marry a Shudra man ,it has to be due to the physical attraction alone (biological urge/sexual attraction) and thus such a prathiloma character is called a chandala ,which name is not given to Maannanaar clan, since the choice is not made by the woman for physical attraction, but by the elders of both clans to keep the races and the society thrive with a social identity According to Beteille (page 41) the traditional Indian system was harmonic ,and the rigid social restrictions were accepted as legitimate ..

This is only a alternative thinking about how the system originated in India and how it is zealously guarded even now by both the lowest and the highest strata and disregarded by middle strata of society. The ambiguity is in the middle strata where lots of experiments of crossbreeding has been allowed and has taken place,just as in domesticated plants and animals and birds .Risley's argument of mixing of two distinct races of Aryan and Non-Aryan (Aryan whites and NonAryan blacks) is not the case .The color of skin does not come in the picture at all ,but the qualities of Thriguna makes all the differences .Whether black or white ,,a Brahmin is one who is interested only in research,learning,teaching and is always a minority academician.Kshathriya are numerous ,who wield power in either small areas or in large territories ,and so too vaisya who are rich traders and agriculturalists . Both these middle strata has .numerous interrelationships with all the different varna and is an ambiguous crossbreed which can raise to occasion when a real need comes .So the pure race is only the Intellectual academician class Brahmin born of a Brahmin mother and a Brahmin father ,and also a ignorant ,yet innocent biologically motivated natural (prakrith) child born of a shudra father and a shudra mother .Only these two are the purest races and are very rare and has to be preserved and that is why both these people show similar traits like endogamous marriage .For all the others ,the ethnic group is the identity ,into which even the two pure races are included through the Brahmin and Shudra as two extremes of the same spectrum .Thus an integration of society was attempted .The ethnic groups (what we now call castes including) are all integrated in a hierarchical order .

Furer –Haimendorf (The position of the tribal population in modern India ,in India and Ceylon :Unity and diversity ,P.Mason ed.London 1967 pp188)says : It is all the more remarkable that despite racial differences no less fundamental than those found in countries with acute race problems ,there never have been any cases of racial tensions in India “. I think this is a observation we have to consider with what I had just mentioned about the marriage system of Varna tradition .

In page 53 Andre Beteille writes that India is a multireligious nation with 80 % Hindus,less than 10 % Muslims ,and regional pockets of Sikhs(Punjab) and Christians(Kerala) .But the communal problem is only with Muslims and Hindus . He adds that Indian Muslims are descendents of Hindus converted to Islam (either as clan/group conversion of Rajputs ,jats,Gujjars in North India, Low caste Hindus in West Bengal . They are of the same anthropomorphic nature and only difference is in life style adopted following conversions (page 54 of same book Society and politics in India

.A.Beteille).Regional and language differences exist among all these groups in a distinct way .For example a Malayali Muslim,Hindu and Christian are integrated by a common language and so on .The religious belief and lifestyle is a very personal thing and the freedom for religion if kept in the limits of personal religion ,there will not be any tension or stress in India which is a nation with tolerance .But we have to make sure that the people of each locality is given proper education regarding our oneness as good human beings and world citizens first,Indians second ,and regional identities as third and personal beliefs and lifestyles(including religious) last .One is given freedom of religion to meditate what one feels or believes and not to trade it or make demands on it in any democratic country .The differences between people is lost only with a common understanding and integration at the grassroots .

Both historians and anthropologists have noted that in traditional India tribes were given a designation –The Jana or people .The janapada is a place where a Jana or people live .During Budhist times there were 16 janapadas in India and 15 were in North India and the entire South India was a united Republic called Andhraka .Chanakya calls this as Dakshinapatha (Modern word is Deccan) and the Northern India is Utharapatha .

Trautman shows Tamils has same fundamental structure and kinship and affinity as Baiga and Konds and in history of India tribal janapada and tribal kings did exist showing that tribals were not powerless people .In fact the Chandelas are of Gond origin and came to power as a tribal dynasty .

A person who has to be accepted as a leader of a people ,whether he belongs to a royal clan or a tribal clan ,had to first demonstrate his prowess as a valiant defender of a people ,and then populate a area (urban or village) with people of different profession so that a prosperous self-sufficient economy is build up with law and order under him .Only such individuals (from any varna) could aspire to be elected into power of royalty with judiciary and army under him and for that people has to support him as a leader and the academicians class has to approve that he is fit for the post .This system was the reason for the peculiar marriage relations of Anuloma ,which the Indians preferred .Can we call this Hinduization ? Or should we call this a method devised by ancient Indian ancestors to keep some degree of equality among all people (of any varna) so that if one show the mettle one can be absorbed and integrated in the hierarchy ? I prefer to think in that way not because I am an Indian but because ,I think human psychology and human cognition and intellect had been used by those elders better than what we do now to sort out problems .Unfortunately people like A Beteille (pp 68) says the tribal dynasty is legitimized only if it becomes Hinduised . He says : This meant ,among others, bringing in Brahmin priests,barbers,washermen and the rest ,and replicating in due course of time the hierarchical structure of the caste “.

What does he mean by the word Hinduisation here ? Is that word justified here ? Any person who wants to demonstrate practically that I can organize a self-sufficient region (socioeconomically,agriculturally,defense oriented and the like) has to get farmers, other workers ,and teachers for children of the families and barber surgeons(in olden days barbers did minor surgery as well) and vairs for the people (jana) and if that is Hinduisation any administrator ,any where in the world is a Hindu .Looking into basic needs of a village is called here as Hinduisation ,whereas actually it is an organizational ability practically demonstrated by an aspiring person of any varna (including tribals leading to tribal dynasty) with people support and confirmation by the academicians and

the royal ministers etc .In fact the integration at top level of hierarchy depended on integration at bottom level ,since the Indian overseas and domestic trade depended on timber,lac,honey,ropes,baskets,mats and other forest products including certain herbs and spices. These were totally under the control of tribal people and their chieftains and they had a control over the transport systems –both over mountains, forests and rivers(land route) and sea routes .A regular supply of materials and labor came from all the strata of society and an integrated system had to be devised and the ancestors devised it .Prof Irfan Habib , a leading authority on Mughal India says that it was not the hierarchy of the system but the hereditary occupation in India which was noticed by all from Megasthenes to Bernier .He says the rigid endogamy of India is a tribal characteristic and this is true .Indian customs all originated in Indian tribal people(jana) and continued and endogamy is not a universal characteristic in all Indian tribes with lot of interchange in middle strata ,several crossbreed are formed .N.K.Bose thinks that Indian (Hindu) society from time of Mahabharatha is structured in such a way that the tribe has a monopoly over its occupation .Whole groups function as basket makers as a guild ,or as woodcutters,architects,or as teachers etc .Each profession has a guild which has networks in each village and town ,both in and out of India (in Babylon ,in Srilanka and in Jawa like that).The specialized professionals and their maintaining relations and boundaries between groups /guilds was important for a socioeconomic reason and the economic ethics of the wider society which put high value on hereditary occupations ,protected occupational monopolies of groups .But did they curb individual talent ? The tribal dynasties which arose from time to time,sons of fisherwoman becoming great Brahmin sage and scions of a great Royal family etc are seen in epics showing that individual talents were not curbed .Oscar Lange (Polish economist) says relations between classes become antagonistic if it is based on property(wealth) .Relations arising from division of labor are on the other hand complementary and non-antagonistic .(Political economy of socialism Delhi 1962)

We need equality for all citizens .We need a collective identity as a nation . We need food self sufficiency and health for all .We need education for all our citizens .That is the aim of a democratic welfare state .In such a goal ,we have to face some questions to ourselves to find a solution .

- 1.Is equality possible without the assignment of social preeminence to individual rights ?
- 2.Is equality possible where collective identities appear so compelling ?

The relation of equality and individualism is highly complex .In some respects they reinforce each other .But in other respects they diverge from each other and are not compatible .So the real challenge is to find a solution for this .If we give our ancestors a little bit of thinking power (as all human beings have) we will find how they were trying to solve it by their administrative and educational and agro economical and guild mechanisms .Whether they were right or not is not the problem here. But what they were trying to achieve was what we are struggling to achieve now is the fact that I want to point out .Calling such attempts as Hinduism (as a religion) is the greatest mistake the modern academicians are making and the politicians are perpetuating so that the society remains nonintegrated at national levels .For this a value based education is needed which gives a national and a humanitarian value to the science of sociology and health .

Andre Beteille (page 231) says according to Simmel the individualism of equality came to Europe only in 18th century which found its expression in Kant's advise to treat man as an end in itself and not a means alone .Every student of biology and anthropology knows that different human races as well as different human beings are unequally endowed due to various factors .So how can we couple individualism with equality of all ?What is common to all individuals and unique to each individual has to be found out and then only the implementation can be done. What is unique for all is the fundamental basic rights for food,clothes,a roof and a healthy environment to live in, primary education and a decent job to live with .The biological needs of every human being is same .The other needs are unique for each individual .Equality of opportunity of education and jobs is what we mean by giving education and jobs for the suppressed groups –like tribals,women etc .The minority rights belong to this category . The society in which all the members are made to conform to average will stagnate .Therefore individuals who show talents have to be identified and given proper human resource management this can be achieved .This was the educational policy of ancients .And it still holds good for any nation .Suppose a person with samathwam Yogam(egalitarian) comes to power ,all gets equal share .But if a person with individualistic selfish tendencies and interested only in biological urges and luxuries of life come to power ,the entire people suffer and inequalities result everywhere . This is why the ancient Indian thought that a samathwa/Sathwik Brahmin is best for administrative and sociopolitical and personal advice on any matter . The unselfish nature and values and wisdom were the qualities of a sathwik person. At the other end of the spectrum is the prathiloma with only biological urges and luxury greeds which is a selfish nature (not nishkamakarma) and such people will be a threat to society was the concept .

In a hierarchy of varna,the ability to ascend the ladder with individualistic values demonstration was thus devised so that each individual will try to cultivate values for which he/she strives for .Dumont writes about Homo hierarchichus,Homoequalis;Holism versus individualism;Indis versus West ;and Beteille(page 240) criticizes him for such rigid classifications .As Beteille says (page 243) we have to do something to redress all inequalities which exist now in our society , and at the same time we have to encourage individual personal development too with a value based education is what I think .This is essential for us to progress as a modern nation of tolerance ,and socioeconomic equality and a high intellectual potential for leading a valuable and healthy life together .We must understand that the body colour,eye colour,jaw or nose appearance does not make us different ,but our brain functions ,our neurological pathways and their use, our values make us different .Giving equal opportunity to all is done by the state policy .But taking it depends on the individual citizens .There the individual abilities do work .Human resource management has an important role there. Giving due recognition based on talents ,and not based on economical and political power or lobbying , can be done only if there is real values in society .And only if real values exist in human mind equality as well as individual human resource development management become proper and for national self sufficiency .When one view the Varna and marriage laws of ancient India in this light ,one can be less harsh to our ancestors .And no one can say what our successors will say of us ,the modern India's policy makers and rulers etc !!!When we judge our ancestors harshly, our children can judge us too in a same way is only a fundamental fact .

Bimal Jalan in *Future of India* (Penguin Viking 2005 pp 7 Introduction) points out that the distributional coalitions of Indian political parties are more interested in influencing distribution of wealth and income in their favor, rather than generation of additional output for the benefit of the public and the accountability of the politicians is apparent than real, till the next elections. But why can't we, the people of India who have the right to elect the Government exercise more vigilance over the conduct of the elected representatives, he asks. Why do they continue to elect corrupt persons? For this he himself gives an answer that corruption has become institutionalized and a universal phenomenon in India after independence. The politicians, the civil servants, the officials in all private and public institutions consider corruption as a part of the administrative system to achieve goals is a problem that has crept in and the common man and woman also has to participate in it because there is no option if he/she has to get a ration card, a license, a permission or a registration..(page 119 Bimal Jalan) For getting the death certificate of my husband I remember how I had to toil, because I refused to pay money for it. And in hospitals the clients find it difficult because all the staff—from lower cadre to doctors—believe in corruption of some sort at some level.

In Public Health Ministry of Health is responsible for ensuring availability of good quality drugs in all parts of the country. Not only drugs but also good quality equipments (for example the disposable bags for blood collection in Blood Banks). But another Ministry (Ministry of chemicals and fertilizers) is responsible for production, regulation, distribution of drugs in all parts of country. Ministry of Health encourages the units, irrespective of their size, to produce high quality drugs by employing state-of-the-art technology. Ministry of Chemicals and Fertilizers favor small scale firms, irrespective of the ability to provide the necessary infrastructure for quality control. When such a disparity occurs, the preference of equipments and drugs purchased in any institution (especially since purchase sections are controlled by the lower as well as higher cadre professionals of different interests) will be controlled by the producing agency which offers commissions, so that the selfish officials do not think of national but their own interests. This corruption is maximum in PWD departments where the roads, bridges etc made with public funds collapse within a few months/years causing greater expenditure. Such corruptions have become a rule which impedes our progress and our economic development.

The reason for the corruption is partly the lack of education (not literacy) about the rights as well as responsibilities of a citizen. We teach the children the rights, but not the responsibilities. Every political party speaks of rights of individuals and groups (especially when they think of a vote bank) but never speaks of the issues of responsibilities associated with it. Swami Ranganathananda, my Guru, has written a beautiful book on responsibilities of an enlightened citizenship. In a parliamentary democracy like India, enlightened citizenship is what we lack. If India follows the right policies and the right responsibilities of an enlightened people, by 2020 it would be the largest economy in the world according to prediction by world economists. For that we have to act in co-operation. The three most important factors which impede our progress are:

1. The deadweight of a past which the academician as well as vote-thirsty politicians go on discussing without offering a solution for overcoming it. The separatism of

Aryan/NonAryan, of Hindu /Muslim, of language barriers etc are a thing of the past and the knowledge of it is for the understanding of the psyche of the nation and march forward in a modern way and not to perpetuate the gaps between people. In a democratic Republic like India all are Indians first and all other identities are secondary to Indian citizenship and if this national feeling is perpetuated, instead of past historical hurts and wounds made deeper, our deadweight of past can be made into a eternal fountain of inspiration as Swami Vivekananda suggested

There are a number of factors like border wars, severe droughts and floods, natural calamities, periodic oil shocks, which are beyond the control of any Government in India. And all these leads to expenditures which are to be met with as and when they happen. And how to deal with such calamities is a effective crisis management which we will discuss in another chapter. If the Government's total internal public debt was a stupendous Rs 500,000 crore by mid 90's, nearly 1/3 rd of it accounted for by assets held in public sector, it is Rs 970000 crores by end of 90's and this doubling is accounted for by need to borrow higher and higher amounts to service the debt. Unless we think of this as a serious problem to deal with, and act accordingly, whatever we want to achieve will be left unachieved. Therefore we have to forget our separatist tendencies and move forward as a united nation and for this the baggage of a past (like religious, class/caste /language barriers) has to be left aside. With that heavy load, our progress forward will be jeopardized.

2. The power of distributional coalitions. Nonaccountability of individual ministers who make all decisions affecting public enterprises or projects under their charge, but are not held responsible or accountable for their outcomes because, the coalition parties to which they belong needs them to be in power is a major problem. This is particularly noticeable in coalition Governments of disparate parties with a thin majority in Parliament or legislatures (page 24 Jalan). He points out that the dominant political coalitions seems to be more interested in distribution of the few available jobs rather than in increasing the overall output, employment and the general welfare of the people (page 84). Greater accountability to the public -of both ministers and civil servants- is needed in such situations.

The power of a leader of a party over its members is unquestioned and what happens in the assembly and parliament is largely determined by the political interests of the different parties, rather than by the intrinsic merits or demerits of actions taken by executive. This is the same problem in other institutions, like a Medical college hospital, where I have worked for more than 32 years. The intrinsic merits or demerits of a drug or equipment or a policy decision, is not considered but the financial interests of the authorities and administrative staff and production companies are given importance. This sort of Doctor/Institution oriented practice has to be changed for client-oriented nation-oriented practice. And in the same way the party-oriented, corruption-oriented political administrative practices have to be changed for a people-oriented nation-oriented and world-oriented (humanity-oriented) practice. For this adequate value based thinking has to be inculcated in all citizens (both ruling and non-ruling people of a nation)

3. The growing disjuncture between economics and politics .The need for higher public investment for greater public good is a perfectly sensible idea but it has lead to an exact opposite effect of higher public consumption with diminishing returns for the public .The political assumption that the elected people will effectively distribute the country's wealth/savings to promote the country's best interest and the administrative assumption that beaureucratic response to implement Government programmes would be abundant have turned to be unrealistic according to Bimal Jalan. According to him the availability of capital is no longer a constraint because of international capital mobility ,but the old mindset against colonialism prevents foreign investment approaches.

There is public-private dichotomy that is growing in our economic life. Why is the Governmental /Public sectors showing a marked deterioration at all levels –especially in the provision of vital public services in fields of education,health,water and transport ? The two elements –fiscal and inability to provide essential services – are intimately connected. There is a growing disjuncture between economics and politics in India and as an example Bimal Jalan quotes the 1996 Congress Government and 2004 Bharatheeya Janatha party Government which performed economically well ,having lost elections and state governments which performed very poor economically in implementing anti-poverty programmes returning to power again and again (page 19).

The reason for this is the public acceptance of corruption as an unavoidable aspect of Public life which we have to change immediately ,if we want to achieve our national aims. Corruption is the primary reason for low productivity in investments, fiscal drains and continued mass poverty .High corruption is associated with wrong choice of high cost public projects ,low maintenance expenditure, poor quality of essential public infrastructure .This in turn increases the cost of production of goods and services by business enterprises ,both private and public. Therefore a strategy to reduce and stop corruption is an urgent necessity .Only by that we can increase and improve our productivity, and alleviate poverty and malnutrition and achieve health of all and become self-sufficient in all fields .Jalan suggests that two statutory provisions in our constitution(Article 311 which provide unlimited protection to corrupt civil servants ;and Official secret Act of 1923 which empowers the Government and its officers to classify any document as top secret including administrative files) to be amended so that the system is made more transparent .He feels that the corruption is thus sanctified by providing an official veil of secrecy .

The state funding of political parties is another way of enhancing corruption. The retail component of corruption is the demand generated by individuals who require various kinds of permissions/sanctions to carry on with ordinary business of life. The wholesale component is generated by self-seeking corporates and businesses to take advantage of a restrictive practice or price control for their profit .With liberalization of economy the demand for wholesale corruption reduced but is still quite high and has to be brought down drastically .

With all these ,India's democratic politics is not a failure but a success .Perkovich ,G (2003) from University of Pennsylvania (lecture in center for advanced studies of India ,23 April 2003 page 17. "The measure of India :what makes Greatness ")remarked : "India ,as an ancient and at once diverse and somehow unified civilization of more than one billion people ,deserves recognition for making steady progress under a democratic governance without trampling on its neighbours.India achieves greatness by maintaining a democratic rule-of-law government and living in relative peace. India achieves greatness by improving the quality of life of its free citizens". And it is noteworthy that India has not had a real famine since independence despite endemic malnourishment and malnutrition . (page 43-44 of Bimal Jalan) .As Nehru said Amartya Sen also says "The opportunity that a democracy opens up has to be positively grabbed in order to achieve the desired effect " .My intention therefore is to find out solution to eliminating regular under nutrition and malnutrition through self-sufficiency of agricultural products in each village ,and curing and healing physical and mental as well as intellectual ailments through an integrated approach ,through a value based educational policy of enlightened citizenship .Only if there is more effective political participation by ordinary citizens (like me ,who can provide ideas and values and scientific integrated knowledge) ,we can implement corrective actions for fuller practice of democracy .Therefore my integrated approach and educational policies (value based)aim at such a participation ,as a responsible ordinary citizen of this great country, a citizen of the world .

A very important area of the economy ,which has been badly affected by fiscal disempowerment in the states ,is that of agriculture. Since 1994-95 ,the rate of growth in agricultural production has been down to less than 2 % per year compared with over 4 % earlier ,since 1980-81. With exception of one or two years the monsoon have generally been good. Yet why this decline ? Lack of financial resources with district authorities, including local panchayaths for capital investments and maintenance is pointed out by Jalan as a cause. One must recognize that the lack of or decline in rate of growth in agriculture is a primary cause of high levels of poverty and increasing disparity in growth of incomes in sectors which are dependent on public investment.Bimal Jalan points out that the need to reduce subsidies which do not benefit the poor and increase the public investment seldom figure in public debates among political leaders even though areas with agriculture as primary occupation send the largest number of representatives to Parliament and state legislatures .(page 85)

Over the years India Government has launched a series of programmes to reduce population, to remove poverty through creation of jobs, the provision of subsidized credit to the poor, and delivery of free food for children and for laborers for exchange of work as service. From the global experience ,the countries which reduce poverty ,improve health and nutrition of people have registered a high and sustained rate of growth as well .But India is an exception. What had happened in kerala as poverty alleviation is actually not a food self-sufficiency of the people ,but a gulf-oriented money increasing purchasing power of population, so that agriculture is neglected .Unemployment, underemployment of people ,as well as employed people shirking work so that it increase the nonproductivity and fiscal deficit of the state is very common in Kerala ,showing a lack

of enlightened citizenship among the employed class .They are aware of only their rights and not of their duties to society, nation and world.

Poverty alleviation is possible in a low-income country with poor basic amenities and poor availability of essential public services (like free primary education, pure drinking water ,water for irrigation, power and transport) only if governments have financial capacity to create necessary infrastructure for provision of such services to poor .The higher the rate of growth of economy, the higher the growth of Government revenues and its capacity to finance social expenditure. India's high growth combined with its persistent poverty shows the public-private dichotomy .The fiscal deterioration and inability to provide basic amenities are interrelated and public resources are dissipated in salary or interest of debts with little or no resources available for expansion of public and publicly supported services in vital sectors.Bimal Jalan points out that the widespread poverty despite high growth rate in private sector and in some parts of public sector (like oil company in which Government has strong monopoly) can be explained by inability of administrative structure,(both ministers and civil servants) to manage resources effectively and deliver public services without massive leakage .(page 97).The public servant ,often at expense of public that he/she is supposed to serve, has full protection of individual rights ,job security (whether in hospitals,secretariats,bus,universities,schools,post office, railways or municipalities) and can go on strike in search of higher wages,promotion,bonus irrespective of the costs and inconvenience to the public (in whose name they are appointed in the first place) and there is nonaccountability for them for non-performance of their duty .In 2003 supreme court judgement against such strikes by Government strikes ,has not been yet implemented and strikes are a common phenomenon in many states ,Kerala being one in the forefront showing how little the state Governments have concern for the national interests and the interests of the people .

A Government order is passed but its implementation takes a long time and many are not implemented due to fiscal stringency . Administrative rules concentrate on the process rather than on the results .Local authorities are given significant authority to implement national programmes ,but their financial authority is greatly limited. Transfers to local authorities for expenditure on health of community is average less than 15 % of the state Government budgets(page 98).The ill-equipped and ill trained staff in public offices and local institutions and the multiplicity of functions given to them makes it difficult to deliver services with a degree of efficiency ,especially in rural areas .Sometimes a multipurpose single health worker in a village has to do almost 47 tasks a day ,on a regular basis (page 99).Therefore the collective responsibility of people in a democracy has become a myth only .No one is concerned about the individual or collective responsibility to the nation .Every one and every group/community/party is concerned with their selfish aims at expense of national /public goals .This is the thing to be addressed in a value based education in which the rights as well as the responsibilities of an enlightened citizenship is understood and carried out .The individual as well as collective responsibility of a democratic nation has to be addressed in educative process realistically for achievement of goals .

It is not that there are no bright and best persons among civil servants and leaders .But that all efforts made by distinguished committees ,commissions, associations and persons with a high value are neutralized by internal conflicts of interests of different trade unions

lead by political parties ,political corruptions, statutory provisions, complicated seniority procedures, fiscal stringency etc .The overwhelming number of clerks,typists,messengers,peons,sweepers and the shortage of skilled staff in all fields including education and health ,senior staff being transferred at short tenures or some never transferred at all (due to power politics and recommendations) all exist which have reduced equality at all levels of implementation .

Human resource development ministry at center was earlier called Ministry of Education .Now it represents 4 different departments.

- 1.Department of education
- 2.Department of culture
- 3.Department of women and child development
- 4.Department of youth affairs and sports

Each has several sub departments and divisions. Department of education has separate units for primary education, secondary education, technical education, teacher's education, higher education, book promotion and copyright planning, languages including Sanskrit, district education and international relations.

Food and food processing is an important function for nutrition and alleviation of hunger of people . This comes under several ministries .

- 1.Ministry of agriculture
- 2.Ministry of food and consumer affairs
- 3.Ministry of health
- 4.Ministry of commerce
- 5.Ministry of food processing
- 6.Rural development

Therefore when a decision is made all these different divisions have to be approached . A proposal requires consideration and approval by all these and an interdepartmental committee or panel is made to look into the matter. A number of secretaries, ministers and their clerks and office staff (many of them with only a casual acquaintance with the subject /or none at all) are deciding factors in each procedures and the process and not the result is verified with utmost scrutiny so that a procedural red tapism has become a rule in administration .In fact one of the reasons for implementation of programmes is the coalition Governments and the several departments through which a file has to go through before it is implemented ..

Bimal Jalan cites an example of the country's godowns bursting with public stocks of food worth Rs 40000 crores that the central Government had allocated for the antipoverty schemes ,yet children in remote villages dying of hunger (page 108).He also says that villages were without water (even with sufficient rains and enough number of water bodies which traditionally were used for water by the villagers) . The first is due to mismanagement of stores of food due to red tapism.But the second is due to mismanagement at the local level of village citizens who could have co-operatively made use of the available water resources and rain water harvesting at local regional level itself .One need not always look at a Government help in such matters when the geographic and climatic features supply adequate water for human use.

The model of public –private partnership (micro privatization under public supervision) is good for our country like many other countries which have adopted it .

There are some threats a honest civil servant faces for being against corruption in India.

1.Threat of transfer to remote parts

2.tempting with lucrative posts/commissions/bribes which the needs of the family makes the vulnerable individual to succumb to corruption

3.Exploiting the desperation of senior officers for post retirement sinecures

4.Alignment of senior officers to one political party while in service and after retirement for personal reasons/gains

5.Radical suggestions from such committees and such experts being one-sided may not be the solution for the national achievement .The committees made of such officials become a culde sac where ideas are lured and strangled according to Kumar A.(2004 Chasing a will o' the wisp ?The Indian express 25 Sept 2004 pp 8).

I have dealt with several problems which our democracy faces –both from my own experience as a medical professional ,teacher and educationist and from the references of others .Where do our potentials lie and where do our weaknesses lie has to be realistically analyzed by ourselves to grow together as a nation .As a health professional ,for me the process of physical,mental,intellectual and spiritual health of the nation is important .It starts with programmes for nutritious food for all ,especially children .

Food self-sufficiency means a self-sufficient agro economy in which ,natural climatic conditions and monsoons of India still plays a very great role .Both rural and urban population has to be fed .Population control of entire nation means for all groups ,irrespective of religion or language etc .And all political leaders (who aspire to become political powers) should conform to this rule of the nation .

1.Nutritious food for all

- Food self sufficiency by agro production
- Population control for all citizens alike
- Water conservation which includes rain water conservation and harvesting and natural water (rivers/freshwater lakes) utilization
- Irrigation in areas where fertility of land ensures food production and the small scale bunds and reinforcements,surangams ,well and tank irrigations used in all areas where it is available
- Organic farming which reduce chemical pollution leading to ill effects on nature as well as on health

For this I have taken a field review and study of an area in South Malabar which is the richest paddy growing area with the only freshwater lake(in S Malabar) and given some solutions for using the water effectively for welfare of the people locally .Both the local villages and the nearby township of Guruvayur can get clean supply of water if this is implemented .

- What is done at present ?
- What was suggested in 1960's by the local leaders ?
- Why it could not be implemented at that time ?

- The present condition .How it can be implemented now ,with powerful diesel engines
- If implemented what are the advantages ?These are the areas I have stressed in the problem and its solution .

The advantages ,if implemented will be

- Freshwater conservation
- Water utilized for making both the puncha kol (below sea level)as well as Kuttadan fields(above sea level which needs irrigation) cultivable
- Water supply to nearby villages and to urban settlements at Guruvayur township(partially during rainy seasons when there is no agriculture)
- Tourism development at ecofriendly level

.The area is a historically important area being the original home of Cochin Perumpadappu swaroopa as Chera kings./perumals and includes all the sangam literature regions of the velirs .

- Protection of the great biodiversity of the region
- Fish culture can be done to increase state revenue

2. Health integration through music therapy is a programme by which I would like to do away with separatisms of religions,castes,languages and other groupist tendencies

This is a part of value based education and the integration of arts and sciences under one roof for client-oriented, family-oriented comprehensive healthcare and humanitarian approach.

In 1882 Max Muller said : If I were to look over the whole world to find out the country most richly endowed with all the wealth ,power and beauty that nature can bestow-in some parts the very paradise on earth-I should point to India ...There are many bright dreams to be dreamt about India ,and many bright deeds to be done in India ,if only you will do them “.